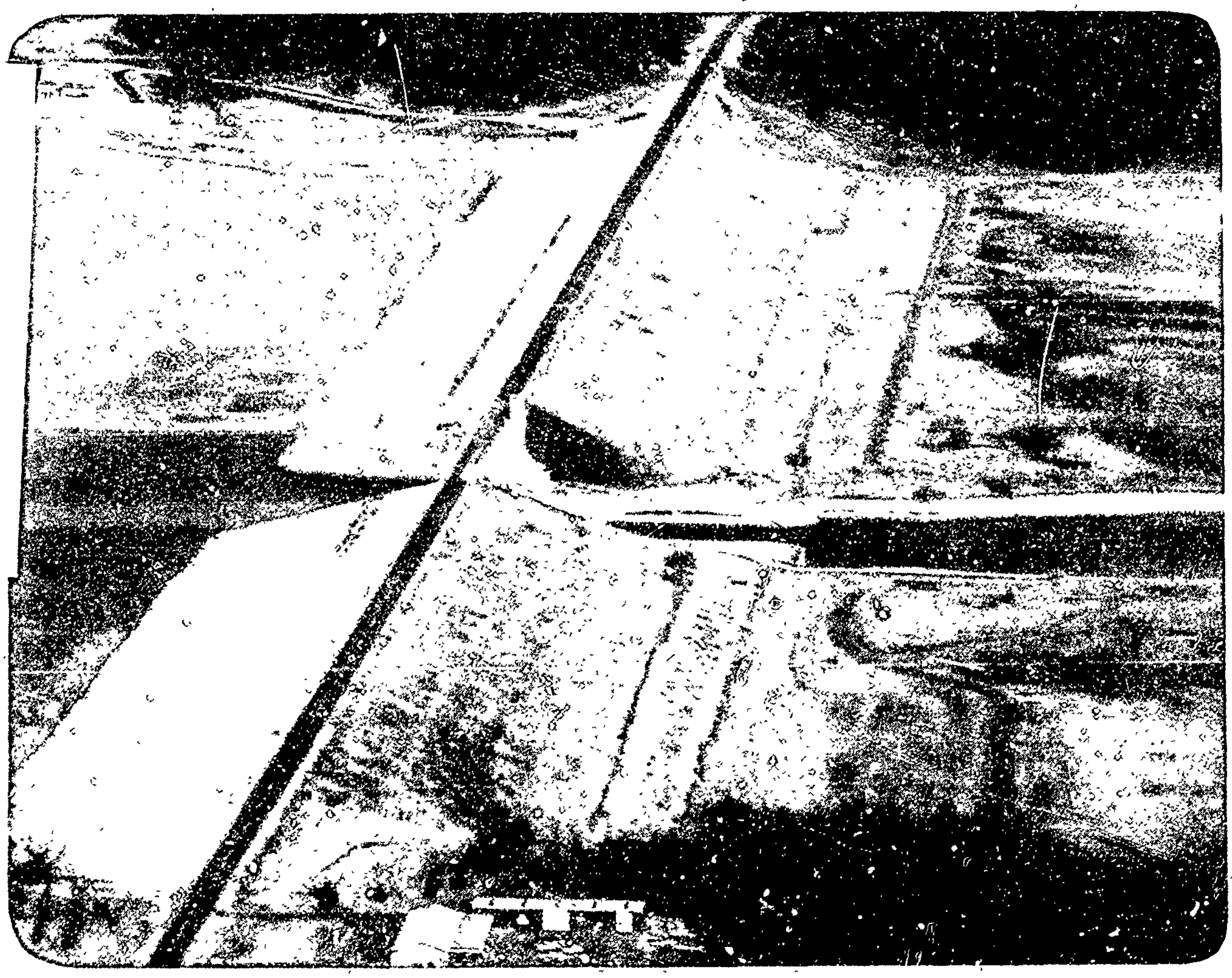
US Army Corps
of Engineers
Rock Island District

WATER CONTROL PLAN
WITH
FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

LAKE RED ROCK, IOWA



MAY 1988

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT. CORPS OF ENGINEERS
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REPLY TO
ATTENTION OF

CENCR-PD-P

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

WITH FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

MAY 1988

ACKNOWLEDGEMENT

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US Army Corps
of Engineers
Rock Island District

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EXECUTIVE SUMMARY

The Water Control Plan examines a range of alternatives for the regulation of Lake Red Rock. Plans were formulated which would address sedimentation within the pool and also would attempt to maximize the multiple uses of the lake. The study of alternatives included: pool raises, dredging, and dry pool. Each alternative was evaluated according to its costs, its effect on the environment, flood damages, erosion and recreation, and social impacts. The plans were compared against the base condition and, based upon analysis, the dredging and dry pool alternatives were eliminated from further consideration. Dredging was found to be far more costly than the expected benefits, and the dry pool was eliminated because it did not provide a low-flow augmentation capability.

The pool raise plans were the only alternatives found to be feasible for dealing with the sedimentation problems. Pool raise alternatives ranged from small increases designed to maintain the minimum conservation pool to a single raise designed to provide 100-year sediment storage. Each of these plans provides comparable net benefits.

The draft Water Control Plan was distributed for a 45-day public review on June 22, 1987. The draft plan had a preliminary recommendation for a near-term pool raise to elevation 736 feet NGVD with a future raise to elevation 742 feet NGVD. Comments were received from over 400 individuals and organizations. Public review comments and responses are located in the Public Involvement appendix.

In October 1987, a report update was distributed to the public which included a change in the recommendation. In light of the comments received during the public review of the draft report, the recommendation was changed to a near-term pool raise to elevation 734 feet NGVD and an ultimate raise to elevation 742. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation would be completed. Public review comments for the modified plan are found in the pertinent correspondence appendix.

Based upon additional review, the final recommendation (Plan 7) has been modified to be a one-step conservation pool raise to elevation 734 feet NGVD. Plan 7 does not include a definite date for a future raise or raises. The final plan includes a 2-foot fall pool raise for the benefit of migrating waterfowl and improvements in the regulation schedule.
(National Geodetic Vertical Datum)

The recommendation, however, recognizes that storage at elevation 734 will be adequate sometime in the future to provide the necessary conservation storage for low-flow augmentation as sediments accumulate. Because of this, it will be necessary to again raise the level of the conservation pool in the future. Computations show that a conservation pool elevation of 742 feet provides adequate low-flow augmentation storage and sediment storage for 100 years of sediment accumulation. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation will be completed. Any plan resulting in a reduction in the degree of flood control provided by the project would require congressional authorization.

E-1

Iowa, Conservation Pool, Sedimentation.

Pertinent Data

Project Name: Lake Red Rock Water Control Plan

NEPA Document: Supplemental Environmental Impact Statement

Original Conservation Pool: Elevation 725 NGVD

Current Conservation Pool: Elevation 728 NGVD

100-Year Conservation Pool: Elevation 742 NGVD

Fall Waterfowl Pool Raise: 2 Feet

Original Reservoir Capacity (1969): 1,830,000 acre-feet

Sediment Deposition in Reservoir (1986 Survey): 79,650 acre-feet

Conservation Pool Capacity (1984): 73,900 acre-feet

Recreation Managing Agencies: Corps of Engineers
State of Iowa
Marion County

Fish and Wildlife Managing Agency: Iowa Department of Natural Resources

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

List of Tables

List of Plates

TABLE OF CONTENTS (Cont'd)

List of Plates (Cont'd)

List of Appendixes

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

SECTION 1 - INTRODUCTION

STUDY AUTHORITY

Lake Red Rock is a unit in the comprehensive plan for flood control in the Upper Mississippi River Basin. The project was initially authorized for flood control in Public Law 761, 75th Congress, second session (approved June 28, 1938) and in accordance with Flood Control Committee Document 1, 75th Congress, first session. Recreation, hydropower, and fish and wildlife facilities were subsequently authorized in Public Law 534, 78th Congress (approved December 22, 1944) and Section 111 of the Water Resources Development Act of 1976 (Public Law 94-587).

Authorities for allocation of storage and regulation of projects owned and operated by the Corps of Engineers are contained in legislative authorization acts and referenced project documents. These public laws and project documents contain provisions for development of water control plans, and appropriate revisions thereto, under the discretionary authority of the Chief of Engineers. Lake Red Rock has been in operation since 1969. The most recent change in operation was in 1976 when the conservation pool was raised to elevation 728 feet National Geodetic Vertical Datum (NGVD). The Rock Island District has determined that the conservation pool level will need to be raised over the first 100 years of the project life to an approximate elevation of 742 feet NGVD. A study was initiated in 1984 to examine alternative methods for coping with sediment over the long term in a manner which optimizes project outputs. As part of the study, the District requested the views of the Office of the Chief of Engineers regarding the authority to implement various alternatives. On January 23, 1986, the Office of the Chief of Engineers provided the following reply:

> We have reviewed the material furnished in the referenced letter on the Rock Island District proposal to permanently raise the elevation of the top of the conservation pool at Lake Red Rock. We find that such modification is within the purview of the Corps authority to operate and maintain the lake for its authorized flood control purpose. Implementation, however, should not be undertaken until the ongoing environmental studies are completed, further coordination with affected parties is accomplished and a new water control plan is approved.

The project background is discussed in Appendix E, Project Background.

STUDY PURPOSE AND SCOPE

The purpose of this study is to develop a revised water control plan for Lake Red Rock to ensure that the project is able to continue to satisfactorily meet all project purposes given the history and projections of sedimentation. Water control plans for Corps of Engineers' reservoirs are required by Engineer Regulation 1110-2-240. Guidance on the preparation and modification of water control plans is contained in the regulation. At Lake Red Rock, low-flow augmentation storage is maintained at 50,000 acre-feet (ac-ft). The accumulation of sediment requires that the elevation of the conservation pool at Lake Red Rock be raised periodically over the life of the project to maintain the 50,000 ac-ft reserve.

If the pool is not raised above the current conservation level of 728 feet NGVD, it will fill with sediment and the 50,000 ac-ft reserve will be lost. The reservoir will not be able to maintain the 300 cubic feet per second (ft3/s) minimum flow at Ottumwa, Iowa. The reason for changing the plan is to achieve a balanced operation which will optimize the multi-purpose objectives of the project. This will be accomplished by selecting a plan of action to provide for flood control and sediment storage, recreation, and low-flow augmentation storage. A change in plans also provides an opportunity for establishing improved release rates.

STUDY AREA

The study area extends from the authorized flood control pool upstream of the Red Rock Dam to the confluence of the Des Moines and Mississippi Rivers. Lake Red Rock is located on the Des Moines River in south-central Iowa, 142.9 river miles above the confluence of the Des Moines and Mississippi Rivers. Plate 1 shows the general location of the project.

The existing interim conservation pool at elevation 728 feet NGVD is located entirely within Marion County. The maximum flood pool at elevation 780 feet NGVD extends into Warren, Jasper, and Polk Counties and reaches 33.5 river miles upstream of the Red Rock Dam. The dam provides downstream flood protection to several small communities, the cities of Ottumwa and Keosauqua, and agricultural lands to the mouth. The project also provides flood control benefits on the Upper Mississippi River from Keokuk, Iowa, to Saverton, Missouri.

TYPE AND DETAIL OF INVESTIGATIONS

Adjustments in the Lake Red Rock conservation pool level are addressed in this report (a Water Control Plan). The accompanying Supplemental Environmental Impact Statement (SEIS) provides an analysis of the environmental impacts of the alternatives presented in the main report. The report includes coordinated regulation schedules for the project and such additional provisions, identified in the authorizing document, as may be required to collect, analyze, and disseminate basic data; to prepare detailed operating instructions; to assure project safety; and to carry out regulation of the project in an appropriate manner.

A Water Control Plan (WCP) is developed for reservoirs and interrelated systems to conform to objectives and specific provisions in authorizing legislation and applicable Corps of Engineers reports. A WCP includes any applicable authorities established after project construction and gives appropriate consideration to all laws relating to recreation and the environment. Thorough analysis and testing are included, as necessary, to develop the optimal water control plans within prevailing constraints.

Two subsequent documents will be required to implement the recommended changes in the operation of Lake Red Rock. Following approval of the WCP, preparation of the following documents will be initiated:

a. Revised Reservoir Regulation Manual - This manual discusses the detailed plan of regulation for conservation, flood control, and water resource management for Lake Red Rock, and serves as a guide for the collection, analysis, and distribution of hydrometeorological data associated with pool level changes and discharge rates.

b. Revised Operation and Maintenance Manual - This manual serves as a guide for the operation and maintenance of Lake Red Rock. It contains general instructions of the major features of the project, and concentrates on such features as the dam and outlet works, remedial works, communications, utility systems and safety. The manual is written for project and management personnel.

RELATED STUDIES, REPORTS, AND EXISTING WATER PROJECTS

EXISTING WATER PROJECTS

Saylorville Dam

Saylorville Dam is located 213.7 river miles upstream from the confluence of the Des Moines and Mississippi Rivers and 70.8 river miles above Red Rock Dam. Saylorville Lake is a multiple-purpose reservoir authorized for flood control, water supply, and recreation purposes. The lake was designed to control flooding derived from a 5,823-square-mile drainage area. The two projects, Lake Red Rock and Saylorville Lake, operate in tandem for the management of floodwaters on the Des Moines River. Saylorville Lake includes storage for low-flow augmentation for environmental and aesthetic purposes. A portion of Saylorville Lake is used for municipal and industrial water supply storage. The general location of the lake is shown on plate 2.

Avon Station Remedial Works

The small, unincorporated community of Avon Station is located in the upper reaches of the Lake Red Rock flood control pool, approximately 4 miles south of the city of Des Moines. Remedial works, including an earthen levee, pump station, road ramps, and a sandbag railroad closure, were constructed by the Corps of Engineers to protect the community from high reservoir levels. The levee crest is at elevation 788.0 feet NGVD. These remedial works form a part of the Lake Red Rock project and are operated and maintained by the Corps of Engineers (see plate 3).

Carlisle Remedial Works

The city of Carlisle lies in the upper reaches of Lake Red Rock approximately 6 miles south of the city of Des Moines. Remedial works, consisting of an earthen levee, four sandbag railroad closures, two gatewells, a ponding area, and incidental works, were provided by the Corps of Engineers to protect the eastern part of the city from high reservoir levels. The levee crest is at elevation 788.0 feet NGVD. These remedial works form a part of the Lake Red Rock project and are operated and maintained by the Corps of Engineers (see plate 4).

Southeast Des Moines Remedial Works

The southeast Des Moines remedial works, located in the extreme upper reaches of the reservoir, covers portions of the city of Des Moines and the adjoining city of Pleasant Hill. Almost all of the area is an industrial development and includes an Iowa Power and Light Company (IPALCO) generating station. Most of the land lies slightly below the easement taking line elevation of 783 feet NGVD. Flowage easements were acquired over part of the area and the remainder is protected by a levee. Protective works consist of earthen levees, a concrete I- and T-wall section, gravity drainage outlets, gatewells, a ponding area, and a stormwater pumping station.

The levee system, with crest elevation at 789 feet NGVD, protects about 1,100 acres and ties into the Des Moines Local Flood Protection Project. Utility lines, roads, and intake and discharge structures were relocated or modified during construction of the remedial works. Operation of the levee system is based upon agreements between the Corps of Engineers and IPALCO. In general, the city of Des Moines and IPALCO operate all outlet and control structures. The Corps of Engineers is responsible for maintenance of the levee, drainage structures (including flapgates and gatewells), the I- and T-wall section, pumping station, ponding area, and drainage ditch (see plate 5).

Roberts Creek Park

Roberts Creek Park is situated on a subimpoundment lake located east of State Highway 14 on a tributary stream of Lake Red Rock. The dam is located on County Road G28 and the lake has a normal pool elevation of 750 feet NGVD. The park is operated by Marion County and has camping, day use, beach, and boat ramp facilities (see plate 6).

Swan Wildlife Refuge Dikes

Wildlife refuge dikes are located within the Lake Red Rock flood pool near the town of Swan downstream of the State Highway 316 bridge over the Des Moines River. The refuge is operated by the Iowa Department of Natural Resources according to a fish and wildlife license issued by the Corps of Engineers. The project contains a series of five low dikes which cover about 1,000 acres (see plate 7).

EXISTING REPORTS

Conservation Storage, Design Memorandum No. 3, January 1957, Rock Island District, Corps of Engineers.

Conservation Storage in Lake Red Rock and Saylorville Lake, Supplement No. 1 to Design Memorandum No. 3, October 1961, Rock Island District, Corps of Engineers.

Red Rock Dam Lake Level Reevaluation Study, Draft Environmental Impact Statement and Technical Report, November 1972, Rock Island District, Corps of Engineers.

Operation and Maintenance, Red Rock Dam and Lake Red Rock, Final Environmental Impact Statement, August 1975, Rock Island District, Corps of Engineers.

Resource Master Plan, Design Memorandum No. 24b, Red Rock Dam, Lake Red Rock, December 1976, Rock Island District, Corps of Engineers.

Des Moines Riverbank Erosion Study, 1979, Rock Island District, Corps of Engineers.

Lake Red Rock, Des Moines River Basin, Des Moines River, Iowa, Report of Sedimentation, February 1980, Rock Island District, Corps of Engineers.

Operation and Maintenance Manual, Lake Red Rock, January 1983, Rock Island District, Corps of Engineers.

Flood Emergency Plan, Lake Red Rock, Iowa, 1983, Rock Island District, Corps of Engineers.

Investigation of Underseepage, Red Rock Dam, Des Moines River, Iowa, November 1984, Rock Island District, Corps of Engineers.

Alternatives to the Regulation of Lake Red Rock, Des Moines River, Iowa, March 1985, Rock Island District, Corps of Engineers.

Assessment of the Relative Contribution of Channel Versus Sheet Erosion in a Midwest River System, July 1985, Iowa State Water Resources Research Institute, Iowa State University.

Plan for Engineering and Design, Des Moines Recreational River and Greenbelt, Des Moines River, Iowa, March 1986, Rock Island District, Corps of Engineers.

Lake Red Rock, Des Moines River Basin, Des Moines River, Iowa, Report of Sedimentation, July 1986, Rock Island District, Corps of Engineers.

A Cultural Resources Management Plan for Lake Red Rock, Iowa, December 1986, Gilbert/Commonwealth for the U.S. Army Corps of Engineers, Rock Island District.

A Cultural Resources Reconnaissance at Lake Red Rock, Iowa, December 1986, Gilbert/Commonwealth for the U.S. Army Corps of Engineers, Rock Island District.

Late Quaternary Landscape Evolution and Geo-Archeology of Lake Red Rock, Iowa, December 1986: draft, Gilbert/Commonwealth for the U.S. Army Corps of Engineers, Rock Island District.

Archeological Survey and Testing, Lake Red Rock, Iowa: The 1984 and 1985 Seasons, December 1986, Gilbert/Commonwealth for the U.S. Army Corps of Engineers, Rock Island District.

Archeological Site Testing, Lake Red Rock, Iowa: Pool Raise Project, 1986 Season, June 1987, American Resources Group, Ltd. for the U.S. Army Corps of Engineers, Rock Island District.

Archeological Testing, NRHP Eligibility Determination and Impact Assessment, Lake Red Rock, Iowa, Pool Raise Project, (Draft), September 1987, American Resources Group, Ltd. for the U.S. Army Corps of Engineers, Rock Island District.

ONGOING STUDIES

Reservoir Sedimentation

The general program pertaining to sedimentation studies in the Des Moines River Basin is discussed in the Master Reservoir Regulation Manual. In Lake Red Rock, 117 sedimentation ranges have been established to measure the deposition of silt throughout the reservoir. Various ranges are resurveyed every 6 to 10 years.

Downstream Channel Studies

The Corps of Engineers has a monitoring program to provide information for evaluation of future streambank erosion problems. This information is analyzed in order to gain insights into the causes of bank erosion. The monitoring program includes:

a. Collecting streamflow records;

b. Sediment sampling at Tracy and Keosauqua, Iowa, and St. Francisville, Missouri;

c. Resurveying degradation and siltation ranges at 5- to 10-year intervals; and

d. Obtaining aerial photographs of the Des Moines River from Red Rock Dam to the confluence with the Mississippi River at irregular intervals based upon Des Moines River hydrologic conditions.

Suspended Sediment Load Studies

The program of suspended sediment load studies in the tributaries to Lake Red Rock has been in operation since 1940. The records for individual locations vary in length. Throughout the authorization, planning, and operational phases of the project, these studies have been used to forecast sedimentation in the reservoir. Forecasts have been refined through the years with the acquisition of additional data. Sedimentation in the reservoir was considered by the Corps of Engineers during the Lake Red Rock project planning stage. The most recent forecast of sedimentation deposition in the reservoir is based on an analysis of these records and sedimentation surveys.

Water Quality Monitoring

Water quality monitoring is being conducted at locations upstream and downstream of the dam. Sampling is performed periodically during the summer months, with emphasis on parameters directly affecting human health and aquatic life.

Investigation of Underseepage

Since the completion of the Red Rock Dam, the Corps of Engineers collected hydrogeologic data. The data are periodically published in reports entitled Investigation of Underseepage. The scope of the studies includes interpretation of data based on pool level, tailwater, and seepage relationships; observation well and piezometric readings; surface seepage; grout gallery flow; specific conductance-dissolved solids relationships; numerical analysis (bicarbonates, sulfates, calcium, magnesium, sodium, and others); water temperature; and other related field observations. There are continuing studies of underseepage in the area of the dam.

Hydropower

A private party (Seaward Development) has received a license from the Federal Energy Regulatory Commission (FERC) to retrofit the Red Rock Dam for hydroelectric power generation. Construction of a 30 megawatt plant is scheduled to begin in 1988 contingent upon the power sales agreement.

Real Estate Easement Acquisition

Public Law 99-190 was enacted in December 1985 to allow for the acquisition of fee title to flowage easement lands from willing sellers within the bounds of the Lake Red Rock project. The Corps of Engineers has prepared a Real Estate Design Memorandum (REDM) which describes the first segment of land to be acquired under this authority. Initiation of acquisition is scheduled to begin in 1988 and to be completed in about 7 years. An Environmental Assessment will be prepared for this action following approval of the REDM.

Des Moines Recreational River and Greenbelt

The Des Moines Recreational River and Greenbelt was authorized by Public Law 99-88 on August 15, 1985. The project is for the development, operation, and maintenance of a recreation and greenbelt area on, and along, the Des Moines River from U.S. Highway 20 in Fort Dodge, Iowa, to relocated State Highway 92 in the vicinity of the Red Rock Dam. Within the Greenbelt boundaries, the Secretary of the Army, acting through the Chief of Engineers, is authorized and directed to proceed with planning, design, engineering, and construction of recreational facilities, streambank stabilization structures, operation and maintenance of existing structures, environmental enhancement for recreational purposes, and the prohibition or limitation of the killing, wounding, or capturing at any time of any wild bird or animal in designated areas. The Greenbelt completely encompasses Lake Red Rock. One Greenbelt project has been constructed at Lake Red Rock -- the Bennington Bridge boat ramp near Runnells, Iowa.

SECTION 2 - PLAN FORMULATION

ASSESSMENT OF PROBLEMS AND OPPORTUNITIES

PROBLEMS

At Tracy, 12.6 miles downstream of the dam, sediment samples have been taken since 1941. Prior to the completion of Lake Red Rock, the average sediment load was 7.8 million tons per year. After the lake was put into operation, the load dropped to 0.6 million tons per year. The difference between the two is an indication of the amount being trapped in Lake Red Rock.

At Lake Red Rock, low-flow augmentation storage is maintained at 50,000 ac-ft. The elevation of the conservation pool at Lake Red Rock must be raised over the life of the project to maintain the 50,000 ac-ft reserve.

Documented precipitation history from 1873-1986 in the Des Moines River Basin shows irregular patterns of precipitation. In 1959, the area precipitation reversed from the predominantly drier than normal pattern of the previous 73 years to an average of above normal, with conditions becoming even wetter from 1968 to 1984. From 1968 to 1984, the basin averaged 34.10 inches of precipitation and ranks as the wettest period of the 1873-1986 record.

This irregular pattern has created a water management problem at Lake Red Rock. Reservoir easement lands were flooded more frequently than expected based on long-term records. Some landowners have requested that the Federal Government either purchase the fee title for the easement lands or grant additional payments to easement holders.

Four percent (79,650 ac-ft, 1986 Survey) of the initial Lake Red Rock storage volume has been lost as a result of sediment accumulation. This has reduced recreational opportunities, aquatic habitat, and the ability to respond to a drought, and has created aesthetic problems. Existing conservation pool depths are inadequate for boating over much of the lake. The development of mudflats in the area of the State Highway 14 bridge has resulted in an aesthetically unattractive condition at normal pool levels.

OPPORTUNITIES

The requirement which exists to raise the pool to some elevation between 728 and 742 feet NGVD (estimated 100-year conservation storage level) provides an opportunity to reduce the adverse impacts of sedimentation, maintain low-flow augmentation for downstream water quality, select improved release rates, improve recreational opportunities, and enhance fish and wildlife conditions.

EXISTING CONDITIONS

Dam

The total drainage area upstream of Red Rock Dam is 12,323 square miles. The dam is a rolled earthfill type which is 5,841 feet long, 110 feet high (maximum), and has a crest elevation at 797 feet NGVD. The main dam and appurtenances were designed to operate against a pool level of 780 feet NGVD. At full flood control pool (elevation 780 feet NGVD) the reservoir averages from about 2.0 to 2.5 miles in width, extends upstream about 33.5 miles, and occupies about 65,500 acres of land. When construction was completed in 1969, the capacity of the conservation pool was 90,000 ac-ft at elevation 725 feet NGVD. The initial total volume of the lake was 1,830,000 ac-ft at elevation 780 feet NGVD. The gated spillway is 241 feet wide, with five tainter gates (45 feet high by 41 feet wide), and has a top elevation of 781 feet NGVD with gates closed. The outlet structure consists of 14 conduits, 5 feet wide and 9 feet high, having a total discharge capacity of 37,500 cubic feet per second (ft3/s) at elevation 780 feet NGVD. Additional project statistics are shown on table 1.

TABLE 1

Project Statistics
Lake Red Rock, Iowa

Drainage Area Above Dam	12,323 square miles
Reservoir Land Data	
Area purchased	47,610 acres
Easement	28,382 acres
Riverbed use rights	2,600 acres

TABLE 1 (Cont'd)

<u>Rolled Earthfill Dam</u>	
Length	5,841 feet
Top elevation	797 feet NGVD
Top width	44 feet
Maximum base width	658 feet
Maximum height above streambed	110 feet
<u>Gravity Concrete Control Section</u>	
Length	563 feet
Gated spillway length	241 feet
Spillway crest elevation	736 feet NGVD
Tainter gates	
Number	5
Size, width by height	41 x 45 feet
Top elevation	781 feet NGVD
Outlet conduits through spillway	
Number	14
Size, width by height	5 x 9 feet
<u>Stilling Basin</u>	
Width	241 feet
Length	180 feet
Floor elevation	654 feet NGVD
End sill elevation	664 feet NGVD
<u>Reservoir Pool Data</u>	
Flood control pool	
Elevation	780 feet NGVD
Length	33 valley miles
Area	65,500 acres
Flood control capacity (1984)	1,676,450 acre-feet
Normal conservation pool (interim)	
Elevation	728 feet NGVD
Length	8 valley miles
Area (Feb. 1987 est.)	6,875 acres
Conservation pool capacity (1984)	73,900 acre-feet
Seasonal conservation pool (when authorized)	
Approximate dates	Sep 15 - Dec 15
Elevation	730 feet NGVD

Reservoir Operation

Lake Red Rock is currently regulated to maintain a permanent pool at elevation 728 feet NGVD by releasing flows of up to 18,000 ft3/s (30,000 ft3/s in the winter months), without exceeding 18,000 ft3/s (30,000 ft3/s during the winter months) at Ottumwa or 22,000 ft3/s (35,000 ft3/s during the winter months) at Keosauqua. Des Moines River flows are measured by a series of gaging stations as shown on plate 8.

The Corps of Engineers determines Lake Red Rock release rates using a a Des Moines River computer model which simulates the tandem operation of Saylorville Lake and Lake Red Rock. A detailed discussion of Lake Red Rock regulation is found in Appendix A, Regulation Evaluation.

The water surface elevation of Lake Red Rock has been recorded since 1969. The pool level was initially set at elevation 725 feet NGVD and was raised to elevation 728 feet NGVD (730 feet NGVD in the fall) in 1976. Tandem operation with Saylorville Lake began in 1977. The water level has frequently exceeded the conservation pool level during the temporary storage of floodwaters. The entire period of record is shown on plates 9 and 10.

The conservation pool volume has historically been maintained between 50,000 ac-ft and and 90,000 ac-ft. Over time, sedimentation reduces storage within the conservation pool which has a negative impact upon low-flow augmentation capability. One alternative to recover low-flow augmentation capability is to raise the conservation pool. If a higher conservation pool elevation would adversely affect flood control capability, congressional approval would be required for a pool raise. If a higher conservation pool would not adversely affect flood control capability, a pool raise is within the authority of the Corps of Engineers.

Flooding on easement lands occurs when the reservoir reaches elevations greater than 760 feet NGVD. A record of those events is shown on plate 11. Since the reservoir operation began in 1969, the following extreme events have occurred, as shown in table 2.

TABLE 2

Extreme Events
Lake Red Rock, Iowa

	Maximum		Minimum	
Event	Parameter	Date	Parameter	Date
Pool Elevation	779.62 NGVD	June 26, 1984	719.68 NGVD	Feb. 18, 1977
Tailwater Elevation	703.75 NGVD	April 8, 1969	687.01 NGVD	Feb. 18-21, 1977
Controlled Release	40,000 ft3/s	June 19-July 6, 1984	200 ft3/s a/	Feb. 17-Mar. 17 & Jun. 17-Aug. 26, 1977
Observed In-flows	86,590 ft3/s (July 17, 1982)	July 17, 1982	---	

a/ This discharge was coordinated with State of Iowa and Federal agencies and concerned members of the public.

Water Quality

Lake Red Rock is a shallow, eutrophic reservoir which usually exhibits weak, intermittent thermal stratification. Any stratification which does develop is disrupted by wind action or advective flow within 4 or 5 weeks. Because of the abundance of highly erodible agricultural land within the basin, the reservoir water is frequently very turbid. This, in combination with relatively short retention times, limits the growth of phytoplankton, and concentrations of algae in the pool are normally very low and constitute no threat to water quality.

Dissolved oxygen concentrations throughout the majority of the water column are adequate to support aquatic life. During periods of stratification, however, low dissolved oxygen concentrations are observed, especially near the bottom of the reservoir. Downstream water quality is acceptable and water temperatures are very close to those observed near the bottom of the reservoir. Because water is usually released through sluice gates located near the bottom of the reservoir, downstream water quality, including water temperatures, can be accurately predicted based upon in-pool bottom temperatures. A detailed discussion of water quality is found in Appendix B, Water Quality Evaluation.

Sedimentation

At Tracy, 12.6 miles downstream of the dam, sediment samples have been taken since 1941. Prior to the completion of Lake Red Rock, the average sediment load was 7.8 million ton per year. After the lake was put into operation, the load dropped to 0.6 million ton per year. The difference between the two is an indication of the amount being trapped in Lake Red Rock.

As of 1985, there was in excess of 39,000 ac-ft of sediment below elevation 725 feet NGVD and more than 79,000 ac-ft of sediment deposited in the entire reservoir. This represents about a 4-percent decrease in total storage. The greatest accumulation of sediment is located between the dam and the area of the State Highway 14 bridge.

The Corps of Engineers has conducted surveys to determine the extent and location of sediment deposits. The sediment range index map is found on plate 12, the sediment profile extending from the dam to the city of Des Moines is found on plate 13, and selected sediment ranges are found on plates 14 to 24. Plate 25 shows an example of mudflat development, which is an August 1984 airphoto mosaic taken with the pool at elevation 730 feet NGVD in the vicinity of the State Highway 14 bridge.

An analysis of the most recent survey by the Corps of Engineers indicates an average annual sedimentation rate of about 5,000 ac-ft. Over the 100-year life of the project, the sedimentation rate is expected to be about 4,000 ac-ft per year and the net accumulation of compacted sedimentation will total about 400,000 ac-ft for the full pool. The projected 100-year sediment figure represents about 20 percent of the original total storage. The 100-year conservation pool would be at elevation 742 feet NGVD. A detailed discussion of sedimentation is found in Appendix C, Red Rock Sediment Entrapment.

Perpetual Flowage Easements

The Lake Red Rock project has permanent and occasional flowage easements over 1,385 tracts of land covering a total of 28,382.49 acres. Acquisition cost of these easements, including severance damages to the remainder, totalled $4,877,178.99. The easements were acquired during the period from 1959 to 1967. Generally, land anticipated to be used less often than once in 5 years for reservoir water storage (elevation 760 to 783 feet NGVD) was retained by the owner with a flowage easement purchased by the Corps of Engineers. Land anticipated to be used for water storage more often than once in 5 years (below elevation 760 feet NGVD) was purchased in fee (land to be owned by the United States).

The easements grant the Corps of Engineers the right to either occasionally r permanently overflow lands between elevations 760 and 783 feet NGVD. The owners retained fee simple title to the land and all such rights as may be used and enjoyed without interfering with the easement acquired. No structures for human habitation are permitted in the flowage easement area. Except for fences, any other proposed structures in the easement area must be approved in writing, in advance, by the officer in charge of the project. Payment for the easements was based on the difference between a "before" and "after" appraisal of each ownership which included consideration of five main factors:

a. The anticipated flooding frequency and duration and its effect on crop loss, changes in crop rotation, and the extra expenses such as fence damage, erosion, tile outlet problems, debris cleanup, and sand and silt deposits incurred in farming an area subject to reservoir flooding.

b. The possible change in the highest and best use of the unit which results from buildings being removed from the affected area and added flooding hazards.

c. The difficulty encountered by the landowner in managing and renting out flowage easement lands.

d. The possible damage to unencumbered parts of the unit resulting from access problems during high water, loss of functional value of buildings due to lower crop yields, and the possible loss of a dependable, safe water supply.

e. The cloud on the title which results in buyer and lending institution resistance to flowage easement land.

The actual frequency of flooding in the reservoir during the operation of Lake Red Rock for the 18-year period of 1969 to 1986 is shown in table 3 and can be compared to the anticipated frequency of flooding used as a guideline by the appraisers during the 1959 to 1967 period.

TABLE 3

Frequency of Flooding on Easement Lands
Lake Red Rock, Iowa

Elevation (NGVD)	Anticipated Frequency of Flooding a/	No. of Times Equalled or Exceeded 1969 to 1986 (18 years) b/
750	Once in 2.2 years	13 times in 18 years
755	Once in 3.4 years	10 times in 18 years
760	Once in 5.0 years	6 times in 18 years
762	Once in 5.9 years	6 times in 18 years
764	Once in 7.0 years	6 times in 18 years
766	Once in 8.3 years	4 times in 18 years
768	Once in 9.9 years	3 times in [illegible]
770	Once in 11.7-12.0 years	3 times in 18 years
772	Once in 14.0-15.0 years	3 times in 18 years
774	Once in 17.3-19.0 years	3 times in 18 years
776	Once in 22.0-26.0 years	2 times in 18 years
778	Once in 29.0-35.0 years	2 times in 18 years
780	Once in 42.0-49.0 years	0 times in 18 years

a/ Anticipated frequency of flooding values used by Corps of Engineers from 1959 to 1967 when lands were appraised for the construction of Lake Red Rock.

b/ A short-term record cannot be compared to the frequency for a long-term record to determine the accuracy of the prediction.

Flooding during the 18-year period has been more frequent than the long-term average estimate used for the easement land appraisals. However, this has been a wetter than normal period. The addition of the 18-year period of record to the 1921-1968 period reveals no change in the long-term elevation-frequency relationship for Lake Red Rock. In the future, there probably will be drier periods that will average out the frequency of flooding with results being closer to the long-term estimates.

The backwater effect can influence flooding above the full flood pool level at elevation 780 feet NGVD. This was taken into consideration when the project was designed and is compensated for since flowage easements were obtained to elevation 783 feet NGVD. Backwater impacts are dependent upon the flow and the pool level as described in Appendix D, Red Rock Backwater Effects.

Outgrants

The Corps of Engineers has issued outgrants to the State of Iowa, Marion County, and private individuals for the use of federally owned lands. Outgrants have been issued to the Iowa Department of Natural Resources for wildlife conservation and management, and for public park and recreation purposes. A commercial outgrant has been issued for a marina development, and a number have been issued for agricultural lands and utility and roadbed rights-of-way.

A complete listing of outgrants is shown in table 4. The list of outgrants is current as of February 1986. The list is subject to change annually as some outgrants may be relinquished and others will expire. Some of the agricultural leases have changed hands and some have had slight reductions in acreages.

TABLE 4

Outgrants
Lake Red Rock, Iowa

Grantee	Contract No.	Type	Eff. Date	Term-Date	Acres	Elevation Information
Bellamy Telephone Co. Telephone Line	DACW2526900511	2	690616	190615	2.3	Above 744.
Bellamy Telephone Co. Telephone Line	DACW2527000104	2	691212	Indef	3.0	Above 744.
Burlington Northern Railroad	DACW2527300134	2	721226	Indef	62.2	Above 744.
Carlisle, City of Sewer Line	DACW2227602009	2	750708	250707	0.2	Above 744.
Carlisle, City of Road & Pumps	DACW2537000008	3	691007	Indef	0.4	Above 744.
Chicago RI & Pacific Railroad	DACW2527100367	2	710526	Indef	20.4	Above 744.
Clark K. Raymond Drain Tiles	110117C6600261	2	651118	901117	0.4	Above 744.

TABLE 4 (Cont'd)

Grantee	Contract No.	Type	Eff. Date	Term-Date	Acres	Elevation Information
Continental Tele Co. Telephone Line	DACW227702004	2	761006	261005	0.0	Above 744.
Continental Tele Co. Telephone Line	DACW2238504165	2	850802	350801	0.0	Above 744.
Carl De Joode Agriculture	DACW2218404057	1	840301	890228	207.0	Above 744.
Carl De Joode Agriculture	DACW2218504036	1	850301	900228	130.0	Above 744.
City of Des Moines Levee	DACW2537200146	3	720315	Indef	1.4	Above 744.
Kay S. Harsin Agriculture	DACW2218504040	1	850301	900228	100.4	Partially under 740.
Kay S. Harsin Agriculture	DACW2218504041	1	850301	900228	87.0	Above 744.
Kay S. Harsin Agriculture	DACW2218504134	1	850301	900228	30.0	Above 744.
Jim L. Hollingshead Agriculture	DACW2218504054	1	850301	900228	75.0	Above 744.
Jim L. Hollingshead Agriculture	DACW2218504055	1	850301	900228	12.0	Above 744.
Iowa Power and Light Electric Line	DACW2527000125	2	700918	Indef	6.8	Above 744.
Iowa Soils Cons Dept Reclaim Strip Mine	DACW2298604121	4	860501	880430	5.0	Above 744.
Iowa Dept Nat Res Water Line	DACW2257000106	2	690930	940929	1.5	Above 744.
Iowa Dept of Trans. Gravel Pile	DACW2218004142	1	800901	900831	1.9	Above 744.
State of Iowa Elk Rock State Park	DACW2516900440	1	690601	940531	2218.9	Partially under 732.
State of Iowa State Highway 14	DACW2527000006	2	700909	Indef	275.9	Above 744.

TABLE 4 (Cont'd)

Grantee	Contract No.	Type	Eff. Date	Term-Date	Acres	Elevation Information
Iowa Dept Nat Res Wildlife Area	DACW2536700142	3	670301	920229	25452.0	---
Iowa Dept of Trans. Gravel Pile	DACW2218604136	1	860613	910612	2.0	Above 744.
Dwight Johnston Agriculture	DACW2218504024	1	850301	900228	92.0	Above 744.
Robert L. Jones Agriculture	DACW2218504023	1	850301	900228	33.0	Above 744.
Lloyd R. Karr Agriculture	DACW2218504021	1	850301	900228	80.0	Partially under 740.
Lloyd R. Karr Agriculture	DACW2218504022	1	850301	900228	33.0	Partially under 740.
City of Knoxville Water Line	DACW2527200101	2	711006	211005	1.8	Partially under 730.
Lake Red Rock Marina Water Line	DACW2527200101	2	711006	211005	1.8	Partially under 728.
Lake Red Rock Marina Commercial Concession	DACW2517300193	1	730327	930326	128.0	Partially under 732.
Marion County Road to Ivan's	110117C6200409	2	620406	Indef	2.2	Downstream of dam.
Marion County South of Dam	110117C6200410	2	620406	Indef	21.4	Downstream of dam.
Marion Co Water Assn Water Line	DACW2228204038	2	811223	Indef	2.1	Partially under 736.
Marion County Road to Tondaville	DACW2228604193	2	850830	Indef	0.9	Above 744.
Marion County Borrow Area	DACW2238404001	3	831016	881015	1.4	Above 744.
Marion County Roberts Creek Park	DACW2516800255	1	680301	930228	1413.0	Unaffected.
Marion County Road to Otley	DACW2526900123	2	681122	Indef	23.1	Above 744.

TABLE 4 (Cont'd)

Grantee	Contract No.	Type	Eff. Date	Term-Date	Acres	Elevation Information
Marion County Boat Ramp	DACW2526900148	2	681220	981219	4.1	Partially below 732.
Marion County Road N. of Hwy 14	DACW2526900509	2	690723	Indef	0.1	Above 744.
Marion County Road Across Dam	DACW2526900513	2	690822	Indef	5.3	Downstream of dam.
Marion County Road West of Swan	DACW2527000110	2	700619	Indef	2.8	Above 744.
Marion County Parking and Boat Ramp	DACW2527000127	2	700305	200304	3.1	Partially under 732.
Marion County Road to South Tailwater	DACW2527100210	2	710329	Indef	11.5	Downstream of dam.
Marion County Road	DACW2527300165	2	730502	Indef	101.4	Above 744.
Marion County Road Across Channel	DACW2536900514	2	690822	Indef	1.0	Above 744.
Marion County Road N. End of Dam	110117C6500045	2	640831	Indef	8.2	Above 744.
Ronald E. Miller Agriculture	DACW2218504029	1	850301	900228	49.0	Above 744.
City of Pella Water Line	DACW2227602294	2	760917	Indef	9.5	Downstream of dam.
Pella Coop Elec Assn Power Line	DACW2527000276	2	700320	Indef	9.5	Above 744.
Polk County Road West of Runnells	DACW2527000109	2	700619	Indef	35.1	Above 744.
City of Runnells Sewer Line	DACW2228104130	2	810706	310705	2.4	Partially under 732.
Dean Sadler Commercial Concession	DACW2517300127	1	730101	971231	18.4	Partially under 732.
Randy Sinnard Agriculture	DACW2218404076	1	840316	890228	18.0	Above 744.

TABLE 4 (Cont'd)

Grantee	Contract No.	Type	Eff. Date	Term-Date	Acres	Elevation Information
R.D. Sullivan Agriculture	DACW221844054	1	840301	890228	12.0	Above 744.
Synhorst Livestock Agriculture	DACW2218504025	1	850301	900228	155.0	Above 744.
Joe Tonda Agriculture	DACW2218504042	1	850301	900228	110.0	Above 744.
David Van Vark Agriculture	DACW2218504039	1	850301	900228	115.0	Above 744.
John VanDeHaar Agriculture	DACW2218504053	1	850301	900228	39.0	Above 744.
Howard VanZante Agriculture	DACW2218504031	1	850301	900228	128.6	Above 744. Possible access problems
Howard VanZante Agriculture	DACW2218504032	1	850301	900228	158.0	Above 744.
Wabash Railroad Co. Railroad	DACW2527100130	2	710205	Indef	168.6	Above 744.
Warren County Road W. of Runnells	DACW2527000111	2	700619	Indef	25.4	Above 744.
Carl Wyers Agriculture	DACW2218504037	1	850301	900228	23.0	Above 744.
Carl Wyers Agriculture	DACW2218504038	1	850301	900228	21.0	Above 744.
Richard Willer Agriculture	DACW2218404093	1	840403	890228	18.0	Above 744.
Richard Willer Agriculture	DACW2218504034	1	850301	900228	20.0	Above 744.
Richard Willer Agriculture	DACW2218504035	1	850301	900228	42.0	Partially under 740.
Brad Worthington Agriculture	DACW2218404048	1	840301	890228	25.0	Above 744.

TABLE 4 (Cont'd)

Definitions for Type of Outgrant

No.	Type	Definition
1	Lease	Corps of Engineers land which is temporarily not required for Government use may be leased for any commercial or private use consistent with the authorized purposes and policies. Examples would include agriculture and commercial concessions.
2	Easement	Easements are generally granted for rights-of-way over, in, and upon lands under Corps of Engineers' control. Examples are utility lines, railroad tracks, and roads. If the proposed use is for other than right-of-way purposes, the granting instrument is a lease.
3	License	A license is a bare authority to do a specified act or series of acts on a licensor's property without acquiring any estate therein, and authorizes an act which would otherwise constitute a trespass. The license instrument provides evidence of the permission granted and of the obligations, responsibilities, and liabilities imposed on the licensee. A license only authorizes the specified use of the property by the licensee.
4	Permit	An instrument authorizing use of property by another Federal agency. A permit is issued to formalize temporary use which has been approved by an appropriate authority, for which verbal permission will not suffice.

Downstream Bank Erosion

A study on bank erosion was completed in 1979 and the findings were published in the Des Moines River Bank Erosion Report. The study pointed out that the primary factors affecting bank erosion along the Des Moines River between Lake Red Rock and the mouth include the natural meandering process, the erodibility of the bank material (which varies widely along different reaches), and the magnitude and variation of river discharge. The report indicates that bank erosion also is affected by manmade structures, including roads, bridges, railroads, urban development and dams, and changes in land use along the river such as conversion of bottomland forests to agricultural fields. Lake Red Rock has affected the magnitude and variation of downstream discharges, but, based on the results of the study, it could not be concluded that bank erosion has changed during the time the project has been in operation.

Federal Recreation

Lake Red Rock is a Corps of Engineers multi-purpose project with 6,875 surface acres at elevation 728 feet NGVD which features land-based and water-based recreational facilities. In general, camping, hiking, and picnicking facilities are not affected by the reservoir operation. The water-based recreation facilities, such as boat ramps and beaches, require modification, replacement, or abandonment as they become buried under accumulating sediment. Activities such as fishing and waterfowl hunting are impacted by changes in the pool level. Major Federal recreation areas at Lake Red Rock are shown on plate 26 and are discussed below.

Whitebreast Recreation Area

Whitebreast recreation area, which is located on the south side of Lake Red Rock about 4 miles northeast of Knoxville, Iowa, features day use areas, overnight camping, a swimming beach, and several boat ramps. Both the Lakeview and Whitebreast Heights boat ramps have been impacted by sediment accumulation and are currently unserviceable. Coal Ridge boat ramp is marginally serviceable (see plate 27).

Whitebreast beach, operated and maintained by the Corps of Engineers, is a natural sand beach that is subjected to constant wave erosion and shifting sand. The beach has slowly shifted from the western edge to the southern edge of the peninsula. A portion of the parking area has suffered from erosion and wave action. The beach is only serviceable up to elevation 738 feet NGVD.

The Corps of Engineers operates and maintains three boat ramps at the Whitebreast Recreation area. The Lakeview boat ramp is subject to severe erosion problems during high lake levels, and, as a result, has become unserviceable. The Coal Ridge boat ramp is only serviceable up to elevation 738 feet NGVD. The Whitebreast Heights boat ramp has become unserviceable because of erosion.

Wallashuck Recreation Area

The Wallashuck recreation area is located on the north shore of Lake Red Rock about 3 miles west of Pella, Iowa, and features camping and day-use areas and two boat ramps (see plate 28).

The Wallashuck campground (east) boat ramp is a two-lane structure which is operated and maintained by the Corps of Engineers. The top of the ramp, located at elevation 737.5 feet NGVD, and the parking lot have riprap protection. The boat ramp and parking lot are only serviceable up to elevation 737 feet NGVD.

The West Wallashuck area is located adjacent to the Red Rock Marina. The two-lane boat ramp and parking lots are operated and maintained by the Corps of Engineers. The present parking area consists of three levels of parking. The lowest parking level, at elevation 735.6 feet NGVD, is only serviceable up to elevation 735 feet NGVD.

Dam Site Area

The dam site area is located in the vicinity of Red Rock Dam about 2 miles southwest of Pella, Iowa. The area features a camping and day-use area, boat ramps, and a beach (see plate 29).

The Corps of Engineers operates and maintains North Overlook beach. This sand beach is a manmade structure which was built above elevation 725 feet NGVD. The beach is only serviceable up to elevation 738 feet NGVD.

The Corps of Engineers operates and maintains the South Overlook boat ramp located on Coal Creek. The facility features a boatway and a surfaced parking lot. The boat ramp is marginally serviceable at elevation 728 feet NGVD and becomes fully serviceable at elevation 730 feet NGVD.

State of Iowa Recreation

Elk Rock State Park is operated and maintained by the Iowa Department of Natural Resources according to an outgrant agreement with the Corps of Engineers. There are two units to the park, a northern half and a southern half, which are split by Lake Red Rock. The park, located about 8 miles west of Pella, Iowa, features camping and day use areas, equestrian trails, and three boat ramps (see plates 30 and 31).

Elk Rock North boat ramp is operated and maintained by the Iowa Department of Natural Resources. The State improved the ramp and parking lot in 1987 (see plate 32). Elk Rock South boat ramp and Elk Rock Water Patrol boat ramp are operated and maintained by the Iowa Department of Natural Resources.

Duck Hunters boat ramp is located on the south side of Lake Red Rock about one-half of a mile west of the State Highway 14 bridge, or about 5 miles north of Knoxville, Iowa. The boat ramp, parking lot, and access road are gravel-surfaced and are used mainly by hunters and fishermen.

Marion County Recreation

Whitebreast Bay Boat Ramp

Whitebreast Bay boat ramp is located on Whitebreast Creek about 3 miles northeast of Knoxville, Iowa. The area is operated and maintained by Marion County according to an outgrant agreement with the Corps of Engineers. The facility can be used only by shallow draft fishing and duck boats above elevation 732 feet NGVD. An old road berm (elevation 731.6 feet NGVD) along the east side of the ramp extends a considerable distance into the water and serves to limit access by certain types of boats (see plate 33).

South Shores Boat Ramp

South Shores boat ramp is located on the south bank of Lake Red Rock about 5 miles northeast of Knoxville, Iowa. The area is operated and maintained by Marion County according to an outgrant agreement with the Corps of Engineers. The boat ramp is currently unserviceable (see plate 33).

Roberts Creek County Park

Roberts Creek County Park is located on the north shore of Lake Red Rock about 6 miles west of Pella, Iowa, and is operated and maintained by Marion County according to an outgrant agreement with the Corps of Engineers. The 300-acre subimpoundment has a normal pool elevati[illegible] of 750 feet NGVD and a flood control pool of 780 feet NGVD. County Roa[illegible] crosses the earthen barrier dam which impounds the flow of Roberts Cre[illegible] see plate 6).

Commercial Concessionaires

Red Rock Marina is located on the north shore of Lake Red Rock about 3 miles west of Pella, Iowa, at the West Wallashuck Recreation Area. The marina is operated by a private concessionaire under an agreement with the Corps of Engineers. The operator has an outgrant for the area which includes privately owned marina facilities. Federally owned parking lots and a boat ramp are located in the same area (see plate 28).

Red Rock Marina's buildings and dock are privately owned by the concessionaire and are operated under an agreement with the Corps of Engineers. Shallow water surrounds the dock at elevation 728 feet NGVD and the mooring area is small. The shoreline in the vicinity of the dock is characterized by a bench between elevations 731 and 733 feet NGVD which drops off nearly vertically at the lake edge to 728 feet NGVD. Soil slumping is a problem in the area between the marina bay and the parking lots. The marina is marginally serviceable up to elevation 736 feet NGVD, especially for deep-draft sailboats. Above this elevation, the marina is fully serviceable for all craft.

Fish and Wildlife Management

Fish and wildlife management is conducted by the Iowa Department of Natural Resources.

Red Rock Wildlife Management Area

The 25,572-acre Red Rock Wildlife Management Area is located upstream of the State Highway 14 bridge and is operated and maintained by the Iowa Department of Natural Resources according to an outgrant agreement with the Corps of Engineers. The area is managed for fish and wildlife purposes and features a number of boat ramps located in the upper reaches of Lake Red Rock and the Des Moines River (see plate 7).

Swan Wildlife Refuge

The waterfowl habitat dikes at the Swan Refuge, located just north of the town of Swan, Iowa, are operated and maintained by the Iowa Department of Natural Resources according to an outgrant agreement with the Corps of Engineers. The refuge is part of the Red Rock Wildlife Management Area. The dikes have a crest elevation of 750 feet NGVD (see plate 7), and are fully serviceable up to elevation 740 feet NGVD. Above this elevation, the dikes become marginally serviceable due to moist soil conditions.

Aesthetics

Mudflats have developed in the vicinity of the State Highway 14 bridge and are visible at water levels near the conservation elevation of 728 feet NGVD (see plate 25). As the pool level increases, the visible mudflats are shifted to areas upstream.

Lake Red Rock, one of the few large bodies of water in the State of Iowa, is surrounded by timbered areas. It is part of the bottomland forest system which is present in the Des Moines River Valley and is a component of the Des Moines Recreational River and Greenbelt.

Bottomland forest and palustrine forested wetlands have been lost from the main lake body due to frequent sustained inundation during recent years. There are areas of intact bottomland habitat at upstream areas near the town of Swan, and near the cities of Runnells and Carlisle where the flood control operation effects have been less severe.

Natural Resources

Natural resources vary greatly from the flood control pool to surrounding higher ground. The original bottomland or river valley conditions have been lost below elevation 750 feet NGVD. Above this elevation, willow and box elder thickets have survived recent high water and give way to older, mature bottomland stands above the cities of Runnells and Carlisle. On project lands surrounding the flood pool, there are natural and man-made prairie areas, oak-hickory woodlands, pine plantations, and agricultural fields cropped for wildlife benefits. The Iowa Department of Natural Resources manages moist-soil planting areas for the benefit of migratory waterfowl. Success of the Iowa Department of Natural Resources waterfowl program varies from year to year depending upon flood conditions and pool levels. Wildlife associated with Lake Red Rock is typical of those species found in the Midwestern United States.

Cultural Resources

Lake Red Rock has a rich and varied cultural resources history which has been extensively studied (See Section 1, Existing Reports). Identification and evaluation of archeological sites to be affected by the proposed pool raise have been finalized. During the fall of 1987, three National Register eligible sites were mitigated and mitigation of eight additional sites will be conducted and finished during the 1988 field season. The proposed mitigation studies will result in a No Adverse Effect determination for the pool raise project (up to 740 feet NGVD). Affected National Register sites located between elev[illegible]s 740 and 760 feet NGVD will be considered for mitigation planning i[illegible] future, as required.

Public Roads and Bridges

Seven bridges are located within the permanent flood pool below elevation 750 feet NGVD. They are located on Federal land, although they may be, in some cases, outgranted to the State of Iowa or Marion County (see plates 34 to 39).

a. Marion County Bridge, Competine Creek - The roadway and bridge are operated and maintained by Marion County according to an outgrant agreement with the Corps of Engineers. The route has a gravel surface and is used for local travel. The bridge is marginally serviceable above elevation 742 feet NGVD. About 500 feet of affected approach road is 1 to 2 feet lower than the bridge deck (see plate 38).

b. Bridge No. 70220028, Calhoun Creek - The bridge is owned by the Corps of Engineers and is marginally serviceable above elevation 739 feet NGVD. The route has a dirt surface and is lightly travelled (see plate 36).

c. Bridge No. 70274910, Calhoun Creek - The bridge is owned by the Corps of Engineers and is unserviceable above elevation 734 feet NGVD. The route has a dirt surface and is lightly travelled (see plate 35).

d. Bridge No. 71220034, Sugar Creek - The bridge is owned by the Corps of Engineers and is marginally serviceable above elevation 741 feet NGVD and unserviceable above elevation 742 feet NGVD. The route has a dirt surface and is lightly travelled (see plate 37).

e. Bridge No. 69306707, Tributary to Whitebreast Creek - The bridge is owned by the Corps of Engineers and is serviceable up to elevation 750 feet NGVD.

f. Bridge, Brush Creek - The bridge is owned by the Corps of Engineers and is located along old State Highway 14. The bridge is not serviceable but is being considered as a fishing pier location for the Des Moines Recreational River and Greenbelt project.

g. Marion County Bridge, Whitebreast Creek - The bridge is operated and maintained by Marion County and is serviceable up to elevation 748 feet NGVD (see plate 39).

Utilities

Some utilities were placed below the pool raise elevation in accordance with outgrants issued by the Corps of Engineers. Utilities were constructed in a manner compatible with the operation of Lake Red Rock.

Project Background

The history of the Lake Red Rock project, with emphasis on sedimentation and pool raises, is found in Appendix E, Project Background.

FUTURE CONDITIONS

Maintenance of the pool at elevation 728 feet NGVD is not an available option for the future because, regardless of the management option selected, natural sedimentation will accumulate in the conservation pool. The most likely future condition without the plan recommended herein would be a series of periodic adjustments in the lake level as sediment fills the pool. Sedimentation is expected to continue at its present rate or slightly less since the current average is based on years with above-normal precipitation.

Under existing operating procedures, the conservation storage would be maintained between a minimum of 50,000 ac-ft and a maximum of 90,000 ac-ft. As an example, the conservation pool is established at a certain elevation with 90,000 ac-ft of storage. Over time, sediment enters the lake and reduces the amount of water in the original pool. Eventually the amount of water is reduced to no less than 50,000 ac-ft. At this point, the conservation pool elevation is raised high enough to gain an additional 40,000 ac-ft of storage (new total of 90,000 ac-ft).

Recreational boating and boat ramps would continue to be hampered by siltation and shallow water problems. Several boat ramps on the lake have chronic siltation problems at water levels near the conservation pool. Boaters have approach problems at the ramps, and deep-draft craft, such as sailboats, have difficulty maneuvering in shallow water areas.

PLANNING OBJECTIVES

NATIONAL OBJECTIVES

The national objectives of water and related land resources planning are to contribute to national economic development in consideration of the quality of the total environment, the well-being of the people of the United States, the prevention of the loss of life, and the preservation of cultural and historical values. The objectives of the study are to determine the optimal plan to establish pool levels and to regulate discharge rates for Lake Red Rock.

SPECIFIC OBJECTIVES WITHIN THE STUDY AREA

The objectives of the water control plan are to select a plan for regulating the conservation pool elevation and outflows at Lake Red Rock to optimize project outputs and benefits to the public during the life of the project. Factors to be considered are the project's authorized purposes for flood control, hydropower, and recreation and fish and wildlife. Related to these authorized purposes are sediment storage, low-flow augmentation, release rates, and mudflat coverage benefits.

PLANNING CONSTRAINTS

The study must comply with authorizing legislation and other pertinent Federal and State laws, regulations, and Executive Orders. In general, the study was conducted in accordance with the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

ALTERNATIVE PLANS

Available measures for sediment storage at Lake Red Rock for the remainder of the 100-year design life include a wide range of options combining alternative pool levels and time periods for level changes. Eight plans were studied in detail: (a) the current plan of operation, (b) five plans which represent the range of options available for raising the conservation pool, (c) dredging, and (d) dry reservoir.

DEVELOPMENT OF ALTERNATIVE PLANS

FORMULATION CRITERIA

The available measures were formulated in consideration of four criteria:

a. Completeness - Completeness is the extent to which a given alternative plan provides and accounts for all the necessary investments, or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private actions if they are crucial to the objective.

b. Effectiveness - Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the recognized opportunities.

c. Efficiency - Efficiency is the extent to which an alternative plan is considered a cost-effective means of solving the specified problems and of realizing the recognized opportunities.

d. Acceptability - Acceptability is the viability of an alternative plan with respect to the desires of the State, local government, and the public. In order to be acceptable, the plan must be in accordance with existing laws, regulations, and public policies.

DESCRIPTION OF PLANS

Eight alternative plans were examined in detail in the report. The most recent sediment survey was completed in 1984 and was used as the base year for pool raise alternatives. The 100-year study period extends from the year 1969 (when the dam was put into operation) to the year 2069. The conservation pool was raised from elevation 725 to 728 feet NGVD in 1976. Detailed regulation information is found in Appendix A, Regulation Evaluation.

1. Current Plan of Operation (Base Condition)

The base condition is the current interim operating plan, also known as the 90/50 plan. In 1969, when the dam was put into operation, 50,000 ac-ft for conservation storage plus an additional 40,000 ac-ft for sediment storage (90,000 ac-ft total) were allocated to the conservation pool. The conservation pool is maintained at a constant elevation (such as 728, etc.) until the sediment storage allotment is lost to siltation (conservation pool volume down to no less than 50,000 ac-ft). At this point, the conservation pool elevation is raised high enough to regain a new 40,000 ac-ft sediment storage allotment.

In practice, the exact elevation required to regain the 40,000 ac-ft sediment storage allotment is computed and then rounded up to the next even foot. Therefore, slightly more than 40,000 ac-ft of sediment storage allotment may be gained for any given pool raise under this plan. For the purpose of this study, the cycle repeats until the conservation pool reaches a maximum elevation of 742 feet NGVD (estimated 100-year conservation pool elevation).

The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources.

Projected pool raise steps (1984 base year):

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1994	10	728	730
1994-2019	25	733	735
2019-2043	25	738	740
2044-2069	25	742	744

Outflows are as follows:

Seasonal	Outflow Not to Exceed (ft3/s)
Non-growing season (December 16 - April 20)	30,000
Growing season (April 21 - December 15)	18,000

During Periods of Downstream Flooding

Non-growing season (December 16 - April 20)	
* Ottumwa, Iowa, gage	30,000
* Keosauqua, Iowa, gage	35,000
Growing season (April 21 - December 15)	
* Ottumwa, Iowa, gage	18,000
* Keosauqua, Iowa, gage	22,000

2. Current Plan of Operation With Improved Regulation (Plan 1)

The current plan of operation with improved regulation (discharge rates) involves maintaining the existing program of periodic raises to recover the 40,000 ac-ft of sediment storage allotment lost to siltation. In addition, slightly greater discharge rates would be allowed than for the base condition for periods when water is stored on easement lands above elevation 760 feet NGVD during the growing season. The non-growing season would be extended from April 20 to April 30. The Mississippi River flood constraints would be raised from 17.0 to 18.5 feet at Burlington, Iowa, and from 18.0 to 20.0 feet at Quincy, Illinois.

The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources.

Projected pool raise steps (1984 base year):

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1994	10	728	730
1994-2019	25	733	735
2019-2044	25	738	740
2044-2069	25	742	744

Outflows are as follows:

Seasonal	Outflow Not to Exceed (ft3/s)
Non-growing season (December 16 - April 30)	30,000
Growing season (May 1 - December 15)	
* Pool level below elevation 760	18,000
* Pool level above elevation 760	22,000
During Periods of Downstream Flooding	
Non-growing season (December 16 - April 30)	
* Ottumwa, Iowa, gage	30,000
* Keosauqua, Iowa, gage	35,000
Growing season (May 1 - December 15)	
Pool level below elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	18,000
* Keosauqua, Iowa, gage	22,000
Pool level above elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	22,000
* Keosauqua, Iowa, gage	26,000

3. One-Step Pool Raise (Plan 2)

The one-step alternative is for a near-term raise to elevation 742 feet NGVD. The conservation pool could be raised as early as the year 1989 following completion of necessary construction work. The raise could be implemented upon completion of the construction or modification of several boat ramps, beaches, and bridges and the recovery of significant archeological sites. In addition, slightly greater discharge rates would be allowed than for the base condition for periods when water is stored on easement lands above elevation 760 feet NGVD during the growing season. The non-growing season would be extended from April 20 to April 30. The Mississippi River flood constraints would be raised from 17.0 to 18.5 feet at Burlington, Iowa, and from 18.0 to 20.0 feet at Quincy, Illinois.

The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources.

Projected pool raise steps (1984 base year):

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1989	5	728	730
1989-2069	80	742	744

Outflows are as follows:

Seasonal	Outflow Not to Exceed (ft3/s)
Non-growing season (December 16 - April 30)	30,000
Growing season (May 1 - December 15)	
* Pool level below elevation 760	18,000
* Pool level above elevation 760	22,000

During Periods of Downstream Flooding

Non-growing season (December 16 - April 30)	
* Ottumwa, Iowa, gage	30,000
* Keosauqua, Iowa, gage	35,000
Growing season (May 1 - December 15)	
Pool level below elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	18,000
* Keosauqua, Iowa, gage	22,000
Pool level above elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	22,000
* Keosauqua, Iowa, gage	26,000

4. Two-Step Pool Raise (Plan 3)

The two-step plan would feature a near-term raise to elevation 736 feet NGVD and a final raise to elevation 742 feet NGVD. The intermediate step to elevation 736 feet NGVD could be physically accomplished in 1988 with no structural modifications following completion of ongoing archeological investigations. In addition, slightly greater discharge rates would be allowed than for the base condition for periods when water is stored on easement lands above elevation 760 feet NGVD during the growing season. The non-growing season would be extended from April 20 to April 30. The Mississippi River flood constraints would be raised from 17.0 to 18.5 feet at Burlington, Iowa, and from 18.0 to 20.0 feet at Quincy, Illinois.

The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources.

Projected pool raise steps (1984 base year):

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1988	4	728	730
1988-1999	11	736	738
1999-2069	70	742	744

Outflows are as follows:

Seasonal	Outflow Not to Exceed (ft3/s)
Non-growing season (December 16 - April 30)	30,000
Growing season (May 1 - December 15)	
* Pool level below elevation 760	18,000
* Pool level above elevation 760	22,000

During Periods of Downstream Flooding

Non-growing season (December 16 - April 30)	
* Ottumwa, Iowa, gage	30,000
* Keosauqua, Iowa, gage	35,000
Growing season (1 May - 15 December)	
Pool level below elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	18,000
* Keosauqua, Iowa, gage	22,000
Pool level above elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	22,000
* Keosauqua, Iowa, gage	26,000

5. Three-Step Pool Raise (Plan 4)

The three-step plan would feature a near term pool raise to elevation 732 feet NGVD with subsequent raises to elevations 736 and 742 feet NGVD. The intermediate step to elevation 732 feet NGVD could be physically accomplished in 1988 with no structural modifications. In addition, slightly greater discharge rates would be allowed than for the base condition for periods when water is stored on easement lands above elevation 760 feet NGVD during the growing season. The non-growing season would be extended from April 20 to April 30. The Mississippi River flood constraints would be raised from 17.0 to 18.5 feet at Burlington, Iowa, and from 18.0 to 20.0 feet at Quincy, Illinois.

The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources.

Projected pool raise steps (1984 base year):

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1988	4	728	730
1988-1994	6	732	734
1994-2004	10	736	738
2004-2069	65	742	744

Outflows are as follows:

Seasonal	Outflow Not to Exceed (ft3/s)
Non-growing season (December 16 - April 30)	30,000
Growing season (1 May - 15 December)	
* Pool level below elevation 760	18,000
* Pool level above elevation 760	22,000
During Periods of Downstream Flooding	
Non-growing season (December 16 - April 30)	
* Ottumwa, Iowa, gage	30,000
* Keosauqua, Iowa, gage	35,000
Growing season (May 1 - December 15)	
Pool level below elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	18,000
* Keosauqua, Iowa, gage	22,000
Pool level above elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	22,000
* Keosauqua, Iowa, gage	26,000

6. Dry Pool (Plan 5)

Under the dry pool alternative, the reservoir would return to a riverine system except when storing floodwaters. The Des Moines River would be allowed to return to its banks under normal conditions. The operating structures at the dam would be kept open during dry periods and there would not be routine ponding behind the dam. The reservoir only would be used when the Des Moines River was flooding. At that time, the dam would be put into operation and floodwaters would be stored only during the flood. Water would be released gradually until the river returned to its normal flow, at which time the dam would be taken out of operation. There would be no conservation pool or low-flow augmentation, and the opportunity for water-based recreation and aquatic habitat management would be greatly reduced.

7. Dredging (Plan 6)

The sediment stored in the reservoir would be dredged and removed to high ground outside of the maximum flood pool. This alternative would involve general dredging in the conservation pool which would be accomplished to remove sediment from the pool. Sediment from general dredge areas would be physically removed from the pool and placed in upland disposal sites.

8. One-Step Pool Raise-734 Option (Plan 7)

The one-step plan (734 option) would feature a raise to elevation 734 feet NGVD. The raise to elevation 734 feet NGVD could be physically accomplished in 1988 with no structural modifications following completion of ongoing archeological investigations. In addition, slightly greater discharge rates would be allowed than for the base condition for periods when water is stored on easement lands above elevation 760 feet NGVD during the growing season. The non-growing season would be extended from April 20 to April 30. The Mississippi River flood constraints would be raised from 17.0 to 18.5 feet at Burlington, Iowa, and from 18.0 to 20.0 feet at Quincy, Illinois.

The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources. The plan does not include a specific date or dates for a future raise or raises.

The plan does recognize, however, that the storage at elevation 734 will be inadequate sometime in the future to provide the necessary conservation storage for low-flow augmentation as sediments accumulate. Because of this, it will be necessary to ag[illegible] raise the level of the conservation pool in the future. Computatio[illegible]ow that a conservation pool elevation of 742 feet provides adequate low-flow augmentation storage and sediment storage for 100 years of sediment accumulation. The year 1999 is used in this report for hydraulic computations and economic comparisons.

The conservation pool is estimated to require raising in the year 2023 to maintain 50,000 ac-ft for low-flow augmentation. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation will be completed.

Outflows are as follows:

Seasonal	Outflow Not to Exceed (ft3/s)
Non-growing season (December 16 - April 30)	30,000
Growing season (May 1 - December 15)	
* Pool level below elevation 760	18,000
* Pool level above elevation 760	22,000
During Periods of Downstream Flooding	
Non-growing season (December 16 - April 30)	
* Ottumwa, Iowa, gage	30,000
* Keosauqua, Iowa, gage	35,000
Growing season (1 May - 15 December)	
Pool level below elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	18,000
* Keosauqua, Iowa, gage	22,000
Pool level above elevation 760 feet NGVD	
* Ottumwa, Iowa, gage	22,000
* Keosauqua, Iowa, gage	26,000

EVALUATION OF ALTERNATIVE PLANS

The general beneficial and adverse impacts of a pool raise will occur regardless of which plan is selected for the future operation of the lake. The object is to select a plan and schedule which will minimize adverse effects and maximize project outputs and benefits to the Nation.

PERIODIC FLOOD DAMAGES

Effects on periodic flood damages in the downstream corridor would be negligible regardless of the alternative. Impacts on flooding of agricultural lands in the pool area would vary among alternatives. Of all of the alternatives, the near-term one-step raise from elevation 728 feet NGVD to a maximum elevation of 742 feet NGVD would produce the greatest negative pool area damage effect, which is estimated to be $85,400 per year in additional crop damages. A gradual, multi-step pool raise plan (Plan 1) would have the most beneficial effect on flood damages, which is estimated to be a $27,400 annual reduction in crop damages. Details of the flood damage analysis for each alternative are found in Appendix F, Economic and Social Analysis.

INUNDATION OF EXISTING FACILITIES

At the present time, the pool could be raised to about elevation 735 or 736 feet NGVD with no significant adverse impacts upon existing facilities, roads, or bridges. There would be impacts to recreational and non-recreational structures if the pool were to be raised above elevation 736 feet NGVD. Impacts would eventually occur with any of the pool raise alternatives. See tables 5 and 6 for summaries of inundation damages.

TABLE 5

Detailed Facility Effects up to Elevation 744 Feet NGVD
Lake Red Rock, Iowa

Elevation	Affected Facility or Structure	Ownership	Problem or Impact
728	Red Rock Marina	Private	Shallow water in harbor hampers boating
730	South Overlook Boat Ramp	Corps of Engineers	Ramp becomes fully serviceable due to higher water
731	Bridge #70274910	Corps of Engineers	Bridge becomes marginally serviceable due to higher water
732	Whitebreast Bay Boat Ramp	Marion County	Ramp enters marginal serviceability due to higher water
732	Old Highway 14 (abandoned)	Corps of Engineers	Submerged road bed becomes boating hazard
735	Bridge #70274910	Corps of Engineers	Bridge becomes unserviceable due to higher water

TABLE 5 (Cont'd)

Elevation	Affected Facility or Structure	Ownership	Problem or Impact
	West Wallashuck Parking Lot	Corps of Engineers	Lowest parking lot becomes unserviceable due to higher water
	North Overlook Beach	Corps of Engineers	Beach becomes marginally serviceable due to higher water
735	Old Highway 14 (abandoned)	Corps of Engineers	Boating hazard eliminated due to higher water
736	Red Rock Marina	Private	Higher pool eliminates shallow water in harbor
	Coal Ridge Boat Ramp	Corps of Engineers	Ramp becomes marginally serviceable due to higher water
737	East Wallashuck Boat Ramp	Corps of Engineers	Ramp becomes marginally serviceable due to higher water
738	East Wallashuck Boat Ramp	Corps of Engineers	Ramp becomes unserviceable due to higher water
739	Whitebreast Bay Boat Ramp	Marion County	Ramp becomes unserviceable due to higher water
739	Whitebreast Beach	Corps of Engineers	Beach becomes unserviceable due to higher water
	Coal Ridge Boat Ramp	Corps of Engineers	Ramp becomes unserviceable due to higher water
	North Overlook Beach	Corps of Engineers	Beach becomes unserviceable due to higher water
740	Bridge #70220028	Corps of Engineers	Bridge becomes marginally serviceable due to higher water
	Swan Wildlife Dikes	IDNR	Dikes become marginally serviceable due to moist soil (higher water)
742	Bridge #71220034	Corps of Engineers	Bridge becomes marginally serviceable due to higher water
744	Bridge on Competine Creek	Marion County	Approach road becomes unserviceable due to higher water
	Bridge #71220034	Corps of Engineers	Bridge becomes unserviceable due to higher water

TABLE 6

Serviceability of Facilities by Elevation
Lake Red Rock, Iowa

Operating Agency	Facility	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744
		Elevation (NGVD)																
Corps of Engineers	N. Overlook Beach	F	F	F	F	F	F	F	M	M	M	M	U	U	U	U	U	U
	Whitebreast Beach	M	M	M	M	M	M	M	M	M	M	M	U	U	U	U	U	U
	Coal Ridge Boat Ramp	F	F	F	F	F	F	F	F	M	M	M	U	U	U	U	U	U
	Lakeview Boat Ramp	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	Whitebreast Heights Boat Ramp	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	South Overlook Boat Ramp	M	M	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	East Wallashuck Boat Ramp	F	F	F	F	F	F	F	F	F	M	U	U	U	U	U	U	U
	West Wallashuck Boat Ramp	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	West Wallashuck Parking Lot	F	F	F	F	F	F	F	F	U	U	U	U	U	U	U	U	U
	Bridge #69306707	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	Bridge #70220028	F	F	F	F	F	F	F	F	F	F	F	F	M	M	M	M	M
	Bridge #70274910	F	F	F	M	M	M	M	U	U	U	U	U	U	U	U	U	U
	Bridge #71220034	F	F	F	F	F	F	F	F	F	F	F	F	F	F	M	M	U
	Bridge Brush Creek	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

TABLE 6 (Cont'd)

Operating Agency	Facility	Elevation (NGVD) 728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	
Iowa Dept. of Natural Resources	Swan Refuge Waterfowl Dikes	F	F	F	F	F	F	F	F	F	F	F	F	M	M	M	M	M
	Elk Rock N. Boat Ramp	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	Elk Rock S. Boat Ramp	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	Elk Rock Water Patrol Boat Ramp	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	Duck Hunters Boat Ramp	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Marion County	Roberts Creek Park	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
	S. Shores Boat Ramp	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	Whitebreast Bay Boat Ramp	U	U	U	U	M	M	M	M	M	M	M	U	U	U	U	U	U
	Bridge Competine Creek	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	M	M
	Bridge Whitebreast Creek	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Private	Red Rock Marina	M	M	M	M	M	M	M	M	F	F	F	F	F	F	F	F	F

F = Fully Serviceable
M = Marginal Use
U = Unserviceable

IMPACTS TO EASEMENT LANDS

As shown on plate A-10 and table 7 below, the pool elevation frequency relationship at elevation 760 (the lowest elevation of easement lands) is nearly the same for all plans. The most current data indicate that for Plans 1, 2, 3, 4 and 7, elevation 760 will be reached on the average of once every 5.26 years or have an annual probability of 19 percent. The base condition, which is Plan 1 without revised release rates, results in elevation 760 being reached once every 5.56 years on an annual probability of 18 percent. The original land acquisition assumed elevation 760 would be reached once every 5.00 years or have an annual flooding probability of 20 percent. Since these probability values are estimates based on the limited period of record available, it is reasonable to conclude that the flood frequencies for land at any specific elevation above elevation 760 are within approximately 1 percent for all plans tabulated.

TABLE 7

Upstream Flood Frequency at Different Conservation Pool Levels
Lake Red Rock, Iowa

	Annual Chance of Flooding (%) at Each Elevation				
Plan	760	765	770	775	780
Frequency of flooding used for land acquisition	20	13	8	5	2
Base Condition	20	14	8	4	<1
Plan 1	19	12	6	3	<1
Plan 2	19	14	7	3	<1
Plan 3	19	14	7	3	<1
Plan 4	19	14	7	3	<1
Plan 7	19	14	7	3	<1

IMPACTS TO OUTGRANTS

There will be impacts to 27 outgranted parcels of land at Lake Red Rock. All lands below elevation 760 feet NGVD are owned by the Corps of Engineers, and all activities conducted within the flood pool are subordinate to reservoir operations and are done at full risk to the outgrant holder. Outgrants affected by a pool raise are listed in table 8.

TABLE 8

Outgrants Affected by a Pool Raise
Lake Red Rock, Iowa

Grantee	Contract No.	Use	Total Acres	Effects (Elev.) 732	736	742
De Joode, Carl	DACW2218504036	Ag.	130.0		X	X
Harsin, Kay	DACW2218504040	Ag.	100.0	X	X	X
Harsin, Kay	DACW2218504041	Ag.	87.0	X	X	X
Harsin, Kay	DACW2218504134	Ag.	30.0	X	X	X
Hollingshead, Jim	DACW2218504054	Ag.	75.0	X	X	X
Hollingshead, Jim	DACW2218504055	Ag.	12.0	X	X	X
Iowa, State of	DACW2516900440	Elk Rock State Park	2218.9	X	X	X
Iowa, State of	DACW2536700142	IDNR Wildlife	25,425.0	X	X	X
Johnston, Dwight	DACW2218504024	Ag.	92.0	X*	X	X
Jones, Robert L.	DACW2218504023	Ag.	33.0	X	X	X
Karr, Lloyd R.	DACW2218504021	Ag.	80.0	X	X	X
Karr, Lloyd R.	DACW2218504022	Ag.	33.0	X	X	X
Knoxville, City of	DACW2527200101	Buried Water Pipe	1.8	X	X	X
Lake Red Rock Marina	DACW2517300193	Commercial Concession	128.0	X	X	X
Marion County Water Assoc.	DACW2228204038	Buried Pipeline	2.1		X	X
Marion County	DACW2526900149	Boat Ramp	4.1	X	X	X
Marion County	DACW2527000127	Boat Ramp	3.1	X	X	X
Miller, Ronald E.	DACW2218504029	Ag.	49.0		X	X
Sadler, Dean	DACW2517300127	Commercial Concession	18.4	X	X	X

TABLE 8 (Cont'd)

Grantee	Contract No.	Use	Total Acres	Effects (Elev.) 732	736	742
Van Vark, David	DACW2218504039	Ag.	115.0			X
Vandeharr, John	DACW2218504053	Ag.	39.0			X
Vanzante, Howard	DACW2218504031	Ag.	128.0			*
Vanzante, Howard	DACW2218504032	Ag.	158.0		X	X
Wyers, Carl	DACW2218504037	Ag.	23.0			X
Weyers, Carl	DACW2218504038	Ag.	21.0			X
Willer, Richard	DACW2218504035	Ag.	42.0		X	X
Worthington, Brad	DACW2218404048	Ag.	25.0	X	X	X

NOTE: Impacts as of December 1, 1986
* - Indicates possible access problems.

SEDIMENTATION

The impacts of alternative plans for pool raises at Lake Red Rock related to the entrapment of sediment for the study period 1984 to 2069 are described in Appendix C, Red Rock Sediment Entrapment. The current plan of operation and Plan 1 result in the least amount of sediment entrapment of about 294,000 ac-ft. Plans 2 through 4 result in greater amounts of entrapment. However, the differences are not significant when compared to the total storage in the reservoir.

It is predicted that, over the long-term average, about 4,000 ac-ft of sediment will be trapped annually. About 80 percent of the sediment is deposited below elevation 740 feet NGVD, which indicates the significance of the impact to the conservation pool. The distribution of future deposition with varying conservation pool levels is difficult to predict. Mudflats typically develop near the conservation pool level. If the conservation pool is raised to elevation 742 feet NGVD, opportunities to inundate them with future raises will be limited. However, if the conservation pool is raised in steps, there will be future opportunities for inundation which will provide additional depth in the shallow fringe areas.

DREDGING

Several major problems are evident with any plan to dredge Lake Red Rock to recover sediment storage capacity. The major drawback to dredging is that in order to recover 40,000 ac-ft of storage it would be necessary to remove about 65,000,000 cubic yards of sediment.

This same volume would have to be trucked out of the maximum flood pool and disposed of in upland sites. Extensive environmental and archeological work would be required before this process could be initiated. Data which are pertinent to the dredging alternative are listed in tables 9 and 10.

TABLE 9

Dredged Material Disposal Site Acreages
Lake Red Rock, Iowa

Height of Sediment (ft)	No. of Acres Required
1	40,000
2	20,000
3	13,300
4	10,000
5	8,000
6	6,700
7	5,700
8	5,000
9	4,400

TABLE 10

Time Required to Dredge 40,000 Acre-Feet
Lake Red Rock, Iowa

Size of Dredge	Days Required	Years Required
5,000 yd3/day	13,000	36
20,000 yd3/day	3,250	9

DOWNSTREAM EROSION

Erosion of the Des Moines River streambanks downstream of Lake Red Rock is a public concern. This is based on the impression that bank erosion is resulting from the operation of Lake Red Rock and that there was little or no erosion prior to the construction of the project in 1969.

The perception that erosion has drastically increased may be due to the lack of observation or concern in years preceding the early 1970's. Before the lake was built, fairly wide buffer strips of natural vegetation and trees were present along the banks. Farmers did not crop these areas, and little effort was made to observe or monitor bank erosion. However, over the years, these natural buffer strips have been removed and converted to agricultural fields. The banks were less protected from erosion and were more easily observed. Changes were clearly measurable in crop losses as sheet erosion and bank sloughing during high flow periods and precipitation events removed crop rows from the riverbank.

Lake Red Rock was designed to provide flood control benefits to downstream areas, including some reaches along the Mississippi River. Changed flows in some way have impacted (including reduced flooding) the entire Des Moines River downstream of the dam. The degree of the impact of Lake Red Rock's operation on downstream bank erosion cannot be accurately assessed based on an analysis of the streamflow variables. The maximum discharge has been reduced by the dam, which would tend to reduce the stream width and the length and width of the meander pattern. Discharges above bank full rarely occur now, which would tend to eliminate the cutting off of large bends or oxbows which reduces the amount of drastic change in stream alignment.

As shown on plates A-3 and A-4, the frequency of downstream flooding is not affected by any of alternative regulation plans evaluated. Therefore, no real estate takings of downstream lands will result, and additional acquisition of interest in downstream lands is not warranted. The minor increase in duration of flooding, as shown on plates A-5 and A-6, could cause the river to erode its banks at different locations in an effort to adjust to the varying hydraulics. However, the overall erosion of downstream banks will remain unchanged by the alternative regulation plans. The primary erosive factor, the total amount of annual flow, has not been changed by the operation of Lake Red Rock. In wet years, when a larger than normal flow is conveyed down the Des Moines River, erosion and noticeable changes in channel alignment would be apparent.

A report entitled <u>Des Moines River Bank Erosion, Iowa and Missouri</u>, prepared by the Rock Island District, Corps of Engineers in August 1979, included a study of aerial photographs and hydrologic records of the Des Moines River downstream of Lake Red Rock. The following paragraph is excerpted from that report:

Analysis of available aerial photographs indicates that the higher rates of change in channel alignment correspond to periods of high rainfall and related high river stages. Three periods of time were analyzed: 1938-1950, 1950-1969, and 1969-1975. Higher rates of erosion were observed in the 1938 to 1950 and the 1969 to 1975 periods. Both of these periods experienced higher-than-normal rainfall for a greater period of time than the 1950-1969 period. During the 1938-1950 period, the river was unregulated while during the 1969-1975 period the river was regulated. Major shifts in channel location were observed during the 1938-1950 unregulated period. This is probably associated with the major floods of the period, notably the flood of record in 1947.

The Corps of Engineers has limited authority to help control erosion at specific sites if a public facility is in danger and benefits of protection are greater than costs.

Streambank erosion is a complex natural phenomenon which is difficult to quantify analytically. Erosion along the lower Des Moines River is impacted by many factors not associated with Lake Red Rock, including soil conditions, local inflow, and natural and man-made structures such as rock ledges and bridge piers. Vegetative cover and land use along the banks also may be significant factors since many areas which were previously left in a natural state are now cleared and cultivated. Aerial photographs taken over a 40-year period indicate no change in the rate of erosion associated with the operation of Lake Red Rock. Proposed changes in the operation of Lake Red Rock may slightly change the discharge duration and frequency relationships. However, these minor changes should not significantly impact the downstream erosion process.

DISCHARGE RATES

All of the pool raise plans include a change in the discharge rate. The rate change would be made to facilitate a faster evacuation of floodwaters. The change in the discharge rate was requested by both upstream and downstream landowners to enhance the probability of having a successful crop. This involves an increase in the discharge from 18,000 ft3/s to 22,000 ft3/s during the growing season when the pool is above elevation 760 feet NGVD, and lengthening the non-growing season from April 20th to April 30th. Impacts of the changes in the discharge schedule are minor, and are described in Appendix A, Regulation Evaluation.

LOW-FLOW AUGMENTATION

All plans, except the dry reservoir, satisfy the requirement for a low-flow augmentation capability.

AESTHETICS

Exposed mudflats are considered an aesthetic problem in the reservoir. An immediate, large pool raise improves the aesthetics at the State Highway 14 bridge by submerging the mudflats, which will redevelop upstream. However, when mudflats develop at the upper end of the pool, they will remain there as long as the pool is maintained at the same elevation. Periodic, small pool raises affect disposition differently than other alternatives. Mudflats will slowly move upstream and will reappear periodically, depending upon the state of the pool raise/mudflat cycle.

RECREATION

Water-based recreation benefits are proportional to the volume, depth, and surface area of water available at a given point in time. An immediate, large raise would produce the greatest recreational benefits because of the increased water depths and surface area. The dry reservoir alternative would have an adverse impact by eliminating a conservation pool which would eliminate most of the present water-based recreation. Improved waterfowling is anticipated to offset other hunting displaced by inundation of lower elevations.

GEOLOGICAL

The current operating plan would not show rapid changes on geologic conditions. Seepage studies have indicated some changes in amounts and chemical characteristics of the water, its movement, and its possible dissolving of some of the rock. The current operating condition with improved regulation would have similar effects with some additional scour in the stilling basin. Increased discharge would cause additional scouring in the stilling basin.

Effects of additional pool raises would be about the same as at present, except that the effects would vary in degree and timing. The one large step alternative would cause the most obvious effect on underseepage. Small, gradual pool raises would allow the best opportunity to observe geological changes.

MINERAL RESOURCES

The primary mineral resources throughout the project area consist of sand and gravel deposits and a few limestone quarries. Historically, coal was mined at a few selected sites, but of limited quantities. Today there are no operating coal mines within the reservoir and it is not likely, with almost no economic reserves, there could be in the future. The most significant limestone/gypsum operation occurs at Durham which is 3 miles downstream from the dam. The Durham operation is not affected by reservoir levels.

Operations for the mining of sand and gravel consist mostly of portable dredges, draglines or clam buckets, and screening and washing equipment. These operations are usually set up when needed along the sand and gravel deposits which are worked intermittently in eastern Polk and Warren counties. The limestone production plants are more permanent at Durham mine with underground mining shovels, loaders, trucks, and the usual above ground crushing and screening equipment. None of these operations should be adversely affected by reservoir changes. Sand and gravel operations in the area have always been subject to seasonal flooding and their operations are conducted in accordance with this condition.

NATURAL RESOURCES

A significant degradation of ecological resources currently exists between elevations 728 to 742 feet NGVD relative to pre-impoundment conditions. Since all pool raise alternatives eventually lead to elevation 742 feet NGVD, the ultimate effects of sedimentation will be the same.

Impacts to terrestrial resources relate to the relative yearly value of habitat flooded by each alternative and the effects on waterfowl food support. Equivalent habitat losses and faunal displacements due to sedimentation ultimately would be expected with each pool raise alternative. Short-term impacts to waterfowl habitat would be greatest with the one-step raise (Plan 2). This primarily relates to the loss of available foraging habitat (mudflats) during fall migration.

No significant adverse impacts are anticipated to the aquatic resources of Lake Red Rock or the Des Moines River downstream of the dam. With the one-step alternative, up to 10,000 acres of aerially or naturally seeded mudflats, currently available as shallows, would be permanently removed from this use. There are a number of positive effects which would result from a pool raise depending on the depth of the raise:

* Larger aquatic resource in both deep and shallow water habitat, until filled by sedimentation.

* Improved access to tributaries for refuge, cover, and spawning.

* Increased shallow water coul . benefit shallows/shoreline vegetation and associated fish species, if flood events are minimal.

* Potentially increased water level stability.

The dry reservoir alternative would have adverse environmental impacts by eliminating a conservation pool which would minimize water storage available for fish and wildlife habitat.

Impacts from dredging accumulated sediment from the conservation pool would involve water quality degradation; upland habitat alteration for drying and stockpiling; aesthetic degradation from constant machinery activity and equipment noise; and fiscal, logistic, and manpower commitment by Federal, State, and local governments.

Impacts to natural resources are further discussed in the Supplemental Environmental Impact Statement.

WATER QUALITY

To assess the water quality impacts of change in conservation pool elevation, the model CE-THERM R-1 was used to simulate in-pool and downstream water temperatures. It was found that no significant increase in the frequency or duration of thermal stratification would result from any of proposed pool raise alternatives. Also, there would be no significant change in downstream water temperatures.

CULTURAL RESOURCES

The fieldwork for the National Register of Historic Places (NRHP) evaluation of 92 archeological sites between elevation 728 and 760 feet NGVD was completed in July 1987. The work was completed through two separate contracts with American Resources Group Ltd. (ARG) from Carbondale, Illinois. Results of these investigations are found in reports entitled: Archeological Testing of 33 Sites, Lake Red Rock, Iowa, Pool Raise Project (by Leah D. Rogers and Brad Koldehoff), and Archeological Testing, NRHP Eligibility Determination and Impact Assessment, Lake Red Rock, Iowa, Pool Raise Project (by Leah Rogers, David Stanley and Jeffery Anderson), both dated 1987.

Based on this work, 6 prehistoric and 5 historic sites have been determined to be eligible for the NRHP by the Iowa State Historic Preservation Officer (SHPO). Table 11 is a summary of the NRHP eligible sites to be affected by the pool raise project. Data recovery plans have been coordinated with the Iowa SHPO and the Advisory Council on Historic Preservation (ACHP) for 3 of the 11 sites, and fieldwork was completed on 3 sites during the fall of 1987 by ARG.

The eight remaining sites will be investigated in the future. Two separate contracts for data recovery - one for historic sites and one for prehistoric sites - will be executed and completed in 1988. As a result of the data recovery work and coordination with the SHPO and the ACHP, the recommended plan will have No Adverse Effect on significant historic properties.

TABLE 11

Status of Data Recovery for Significant Archeological Sites
Present Within the Impact Zone for the Proposed Pool Raise
Lake Red Rock, Iowa

Site (13MA)	Elevation (NGVD)	Site Type	Status
262	740-745	Historic farmstead	Fieldwork complete
400	735-755	Historic farmstead	Fieldwork complete
387	748-768	Prehistoric	Fieldwork complete
207	740-750	Prehistoric	Fieldwork Summer 1988
208	740-750	Prehistoric	Fieldwork Summer 1988
209	740-750	Prehistoric	Fieldwork Summer 1988
266	740-750	Historic farmstead	Fieldwork Summer 1988
324	740-750	Prehistoric	Fieldwork Summer 1988
385	740-760	Prehistoric	Fieldwork Summer 1988
347	740	Historic Village	Fieldwork Summer 1988
449	740-770	Historic Village	Fieldwork Summer 1988

COSTS

From the economic value perspective, the timing of the scheduled implementation outlays significantly affects the assessment of each plan. The present worth of future scheduled pool raises was considered in evaluating base year costs of each plan. Table F-8 in Appendix F, Economic and Social Analysis, details the cost analysis for the pool raise plans. Construction costs for each plan are summarized in tables 12 through 14. Site planning details for affected facilities are found in Appendix G, Site Planning.

TABLE 12

Construction Costs for Pool Raise Alternatives
Lake Red Rock, Iowa

Item		Federal Cost ($)
North Overlook Beach		245,200
East Wallashuck Boat Ramp		304,700
Whitebreast Beach and Boat Ramp		846,200
Bridge No. 70274910 (Removal)		10,000
West Wallashuck Parking Lots		9,800
	Subtotal -	1,415,900
	Contingencies (20%) -	283,200
	Subtotal -	1,699,100
	Engineering and Design (7%) -	118,900
	Supervision and Administration (5.5%) -	93,500
	Total -	1,911,500

Notes:

- 1987 prices
- Construction to be completed by the year: (1) Base Condition and Plan 1 - 2044, (2) Plan 2 - 1989, (3) Plan 3 - 1999, (4) Plan 4 - 2004, and (5) Plan 7 - 1999 assumed for analytical purposes

TABLE 13

Construction Costs for Plan 5 (Dry Pool)
Lake Red Rock, Iowa

Item		Federal Cost ($)
North Overlook Beach		845,000
Whitebreast Beach		825,000
Coal Ridge Boat Ramp		410,000
Whitebreast Boat Ramp		290,000
Wallashuck East Boat Ramp		375,000
Wallashuck West Boat Ramp		327,000
Access Roads		1,444,000
	Subtotal -	4,516,000
	Contingencies (20%) -	904,000
	Subtotal -	5,420,000
	Engineering and Design (7%) -	650,000
	Supervision and Administration (5.5%) -	300,000
	Total -	6,370,000

TABLE 14

Construction Costs for Plan 6 (Dredging)
Lake Red Rock, Iowa

Item	Federal Cost ($)
Disposal Site (8,000 acres, avg. 5 ft deep)	9,000,000
Dredge and Pump (65,000,000 yd3, 2,000 ft avg. distance)	304,500,000
Hauling (10 mile avg. distance)	304,500,000
Handling (dump and spread)	130,000,000
Subtotal -	748,000,000
Contingencies (20%) -	153,300,000
Subtotal -	901,300,000
Engineering and Design (7%) -	63,100,000
Supervision and Administration (5.5%) -	49,600,000
Total -	1,000,000,000

SOCIAL IMPACTS

The social impacts associated with each pool raise alternative are insignificant. An assessment of institutional support for the various pool raise alternatives indicated that Plans 2 and 3 received the greatest backing from elected officials, State and county governments, and special interest groups. Area agricultural interests generally support either Plans 1 or 4. Detailed social discussions are found in Appendix F, Economic and Social Analysis.

COST-SHARING

In accordance with current Corps of Engineers guidance, any future raising of the pool above elevation 734 feet NGVD to maintain the desired 50,000 ac-ft of conservation storage will require local cooperation agreements. The likely local sponsor would be the State of Iowa.

COMPARISON OF ALTERNATIVE PLANS

The plans which maintain a lower conservation pool level will trap less sediment and provide greater flood protection than plans which call for higher pool levels. Lower pool levels are also beneficial to cultural resources, best prevent upstream damages, and have the lowest cost.

Plans which quickly reach a high conservation pool level make the best provisions for low-flow augmentation, aquatic habitat, and recreational benefits.

Plans which use a multi-step scheme to reach high conservation pool levels provide the best coverage of mudflats and the greatest National Economic Development benefits.

PRESENTATION OF FINAL ARRAY OF PLANS

Each alternative was examined and analyzed in consideration of the study purpose and scope, problems and opportunities, planning objectives, and planning const ·ints. A total of seven plans and the base condition were considered in the study. The dry pool alternative was eliminated because it did not make allowances for low-flow augmentation and had an adverse impact upon recreation and existing recreational facilities. The dredging alternative was eliminated because it was not economically justified and would have significant environmental and social impacts.

Acceptable Plans	Eliminated Plans
Base Condition (Three-Step)	Plan 5 - Dry Pool
Plan 1 (Three-Step)	Plan 6 - Dredging
Plan 2 (One-Step to 742)	
Plan 3 (Two-Step)	
Plan 4 (Three-Step)	
Plan 7 (One-Step to 734)	

SELECTION OF THE FINAL PLAN

The recommended alternative is Plan 7 which involves an immediate conservation pool raise to elevation 734 feet NGVD. The plan does not include a specific date or dates for a future raise or raises. The pool raise to elevation 734 feet NGVD was selected for the following reasons:

1. It will preserve a number of options for future resource management.

2. It will permit maximum flexibility with respect to cost-sharing recreational facility relocations with State and local governments.

3. It will preserve more flood control capacity (than higher pools).

The plan does recognize, however, that the storage at elevation 734 will be inadequate sometime in the future to provide the necessary conservation storage for low-flow augmentation as sediments accumulate. Because of this, it will be necessary to again raise the level of the conservation pool in the future. Computations show that a conservation pool elevation of 742 feet provides adequate low-flow augmentation storage and sediment storage for 100 years of sediment accumulation. The year 1999 is used in this report for hydraulic computations and economic comparisions. The conservation pool is estimated to require raising in the year 2023 to maintain 50,000 ac-ft for low-flow augmentation. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation will be completed.

SECTION 3 - DESCRIPTION OF THE SELECTED PLAN

PLAN COMPONENTS

The plan involves three components. The first is a conservation pool raise to elevation 734 feet NGVD. The second component is the improvement of discharge rates from the dam. The third is for a seasonal pool variation study to be conducted following approval of the report.

DESIGN AND CONSTRUCTION CONSIDERATIONS

The pool raise to elevation 734 feet NGVD does not involve construction, so there are no design or construction considerations.

OPERATION AND MAINTENENCE CONSIDERATIONS

The conservation pool raise will require new regulation and operation and maintenance manuals for Lake Red Rock. Operation and maintenance requirements will initially be less than the present condition since tne higher pool will eliminate sedimentation problems at the boat ramps. Over time, operation and maintenance requirements will return to levels similar to the present condition.

PLAN ACCOMPLISHMENTS

The planning objective was to select a plan for regulating the conservation pool elevation and outflows at Lake Red Rock to optimize project outputs and benefits to the public during the life of the project. The recommended plan reasonably accomplishes the planning objectives.

SECTION 4 - PLAN IMPLEMENTATION

INSTITUTIONAL REQUIREMENTS

The schedule for the completion of the study is found in table 15, and funding needs for fiscal year 1989 are found in table 16. There are no construction costs associated with the conservation pool raise to elevation 734 feet NGVD.

TABLE 15

Project Completion Schedule
Lake Red Rock, Iowa

Event	Date
Final report distribution to the public	June 88
Operate conservation pool at 734 feet NGVD and initiate seasonal pool variation study	August 88

TABLE 16

Funding Requirements
Lake Red Rock, Iowa

Item	Federal Cost ($)
Seasonal Conservation Pool Variation Study	75,000
	Total - $75,000

IMPLEMENTATION RESPONSIBILITIES

FEDERAL RESPONSIBILITIES

The Corps of Engineers will be responsible for revising the regulation and operation and maintenance manuals for Lake Red Rock and initiating a seasonal pool variation study in cooperation with the State of Iowa and other interested parties.

NON-FEDERAL RESPONSIBILITIES

The non-Federal responsibilities associated with the recommended plan include future coordination efforts for the seasonal pool raise study and coordination efforts associated with negotiation of an agreement for accomplishing future pool modifications.

VIEWS OF IMPLEMENTING ENTITIES

The Corps of Engineers has determined that a conservation pool raise to elevation 734 feet NGVD is in the Federal interest.

SECTION 5 - SUMMARY OF COORDINATION, PUBLIC VIEWS, AND COMMENTS

An evening public workshop was held on March 26, 1985, in Ottumwa, Iowa, and an afternoon and an evening workshop were held on March 27, 1985, in Knoxville, Iowa. At each workshop, the history of the project and the current planning process were presented. The public participated in group discussions by asking questions and voicing their opinions and concerns to the Corps of Engineers representatives.

The majority of the comments received during and after public meetings favored a pool raise. A pool raise generally was supported by the recreationists and environmentalists, while easement landowners and others expressed some concerns.

Several periodic update newsletters were sent to the interested public by the Corps of Engineers. The comments and concerns expressed by those mentioned in the paragraph above were discussed in more detail in those newsletters. The newsletters contained information on study progress and pertinent information.

A public meeting for the draft Water Control Plan was held in Pella, Iowa, on July 7, 1987. Over 400 persons attended the meeting, and easement lands, reservoir operation, and flooding were the major public concerns. Comments received at the public meeting and during the draft review phase are found in Appendix H, Public Involvement. Letters of correspondence and additional public review comments regarding Plan 7 are found in Appendix I, Pertinent Correspondence.

SECTION 6 - RECOMMENDATION

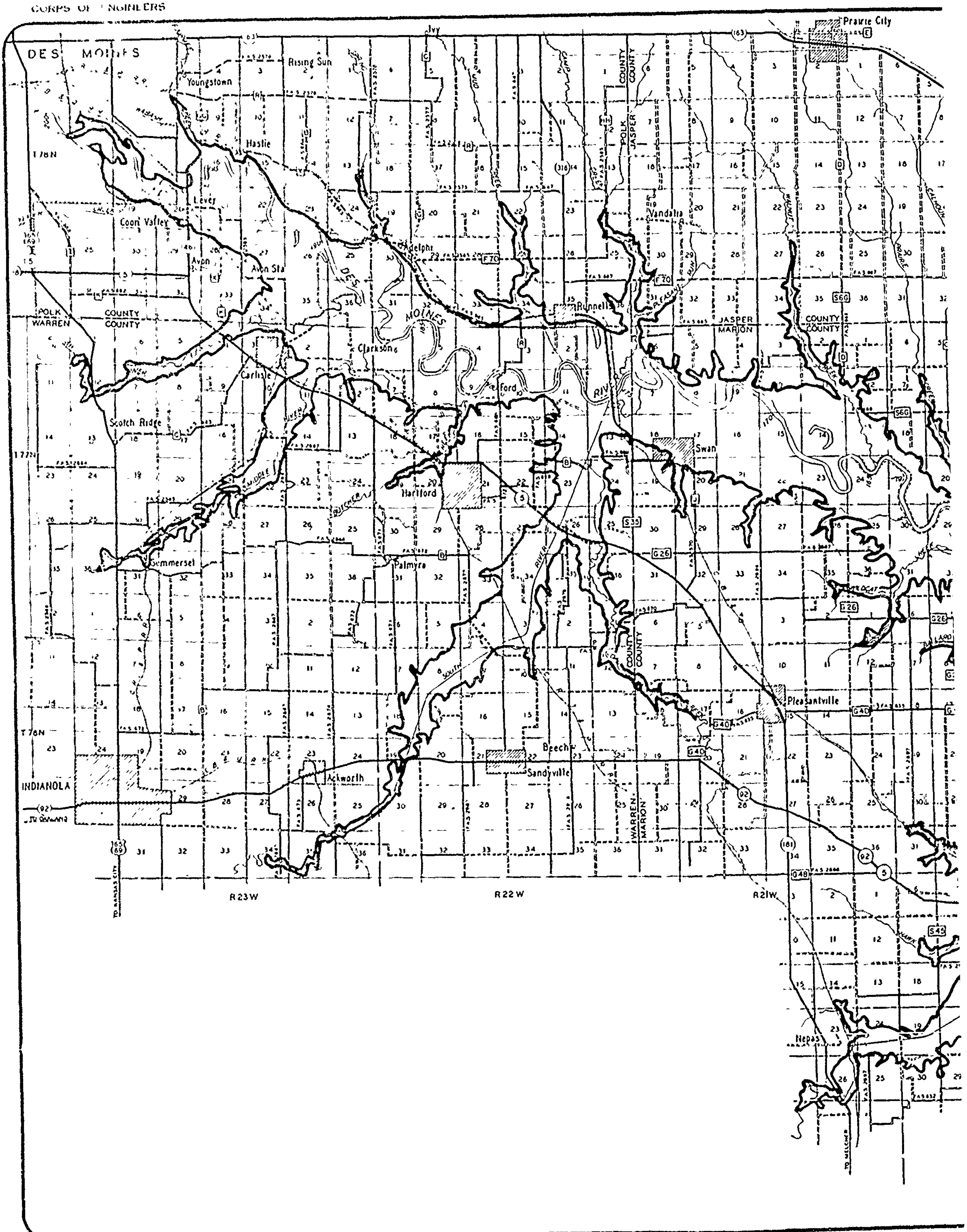
After careful consideration of all of the available data, the analyses of those data, and the conclusions that can be drawn therefrom:

1. I recommend that the permanent conservation pool at Lake Red Rock be established at elevation 734 feet NGVD and that the regulation schedule be modified as soon as practicable after approval of the subject plan. The conservation pool raise and regulation schedule modifications will be accomplished as described by Plan 7 and table A-1 in the report.

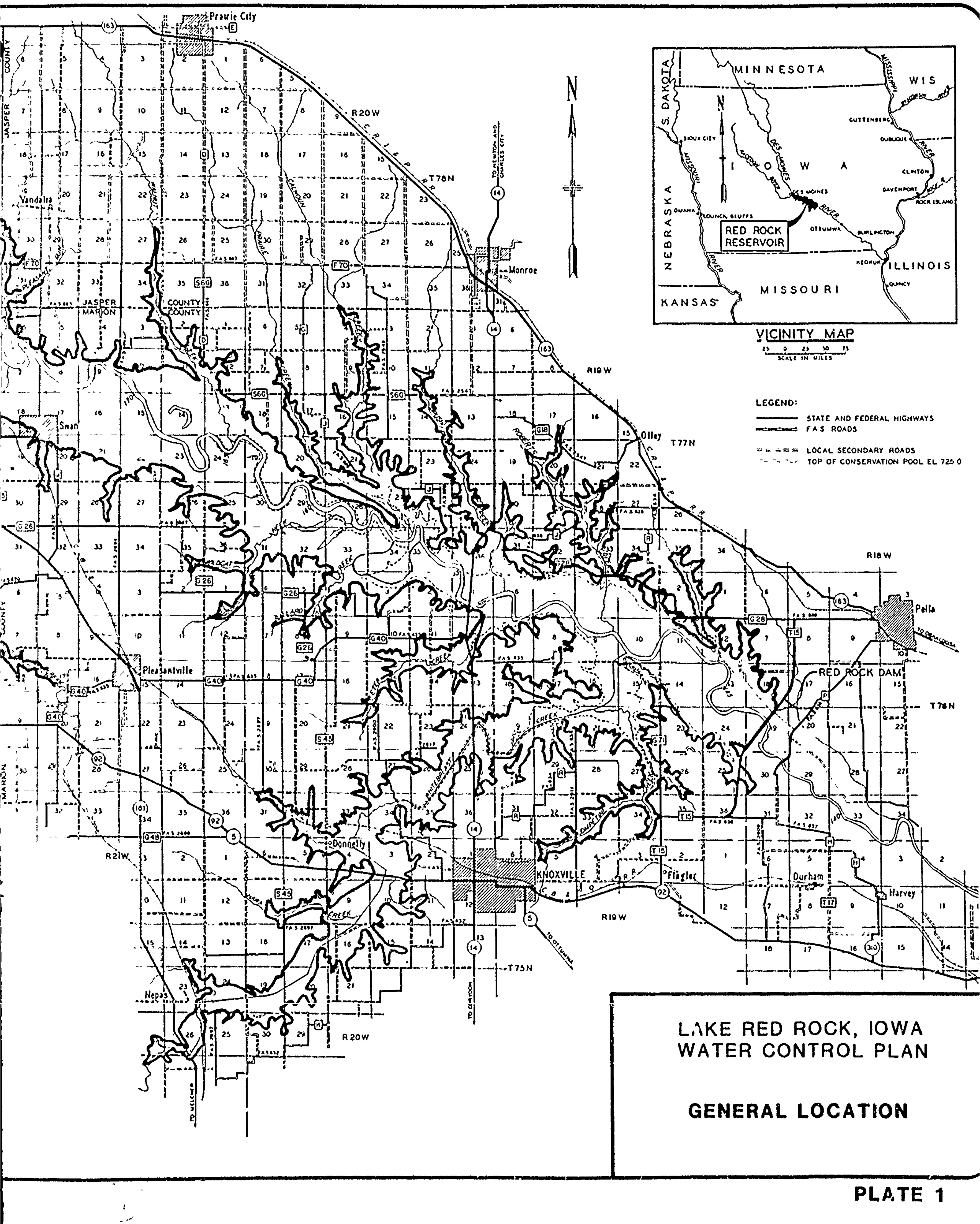
2. I recognize that the storage at elevation 734.0 will be inadequate sometime in the future to provide the necessary conservation storage for low-flow augmentation as sediments accumulate. Because of this, it will be necessary to again raise the level of the conservation pool in the future. Computations show that a conservation pool elevation of 742.0 feet provides adequate low-flow augumentation storage and sediment storage for 100 years of sediment accumulation. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation will be completed. Any plan resulting in a reduction in the degree of flood control provided by the project would require congressional authorization.

3. I recommend that a seasonal pool variation study be carried out expeditiously in order to be responsive to the concerns of the U.S. Fish and Wildlife Service and the State of Iowa.

Neil A. Smart
Colonel, U.S. Army
District Engineer


DES MOINES
Youngstown
Rising Sun
Ivy
Prairie City
Hastie
Lever
Coon Valley
Avon
Avon Sta
Adelphi
Runnells
Vandalia
POLK COUNTY
WARREN COUNTY
POLK COUNTY
JASPER COUNTY
JASPER
MARION
COUNTY
COUNTY
Clarkson
Carlisle
Ford
DES MOINES RIV
Scotch Ridge
Swan
Hartford
Palmyra
Summerset
Pleasantville
Beech
Sandyville
Ackworth
INDIANOLA
WARREN
MARION
T78N
T77N
T76N
R23W
R22W
R21W

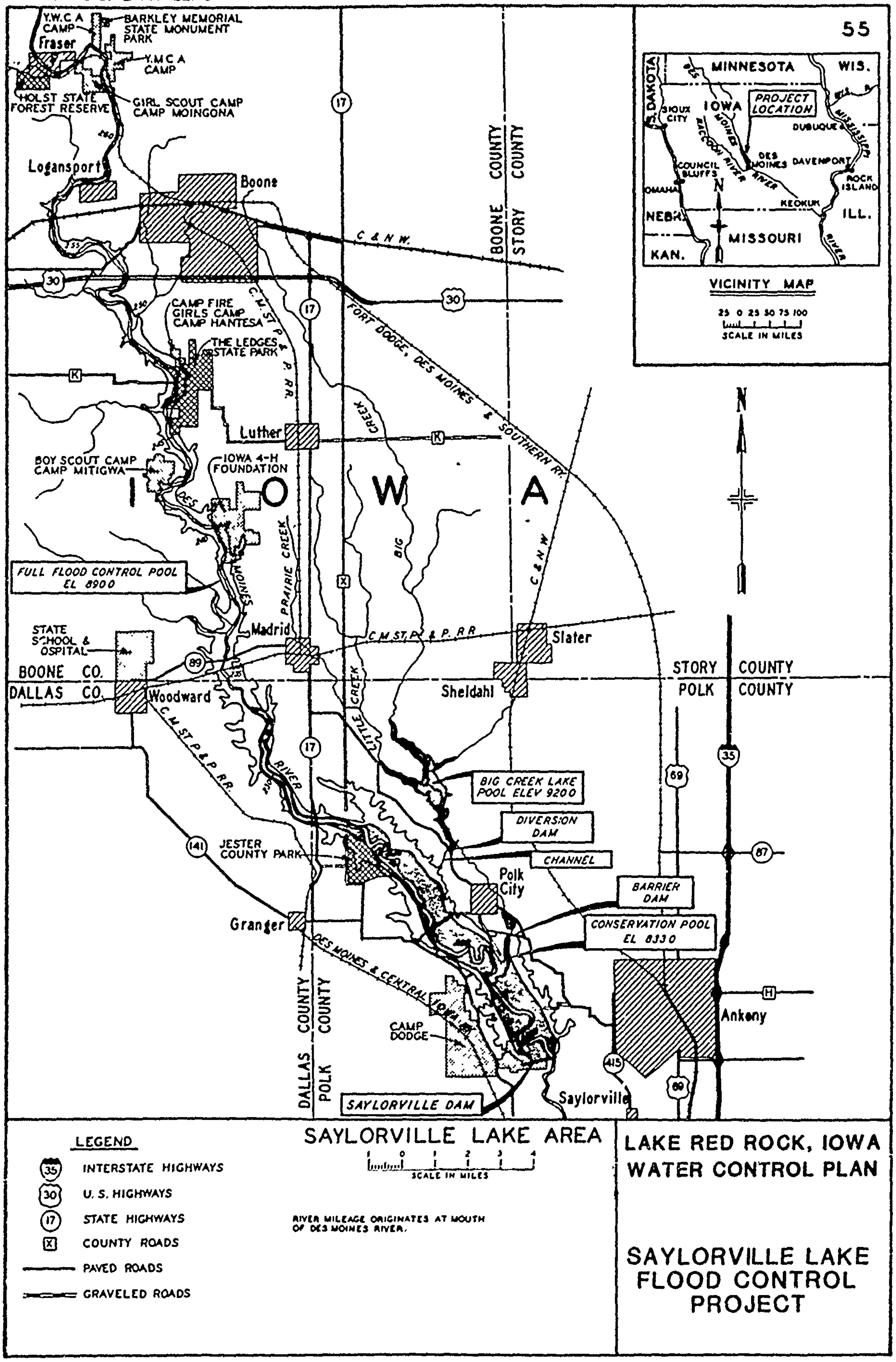
U. S. ARMY



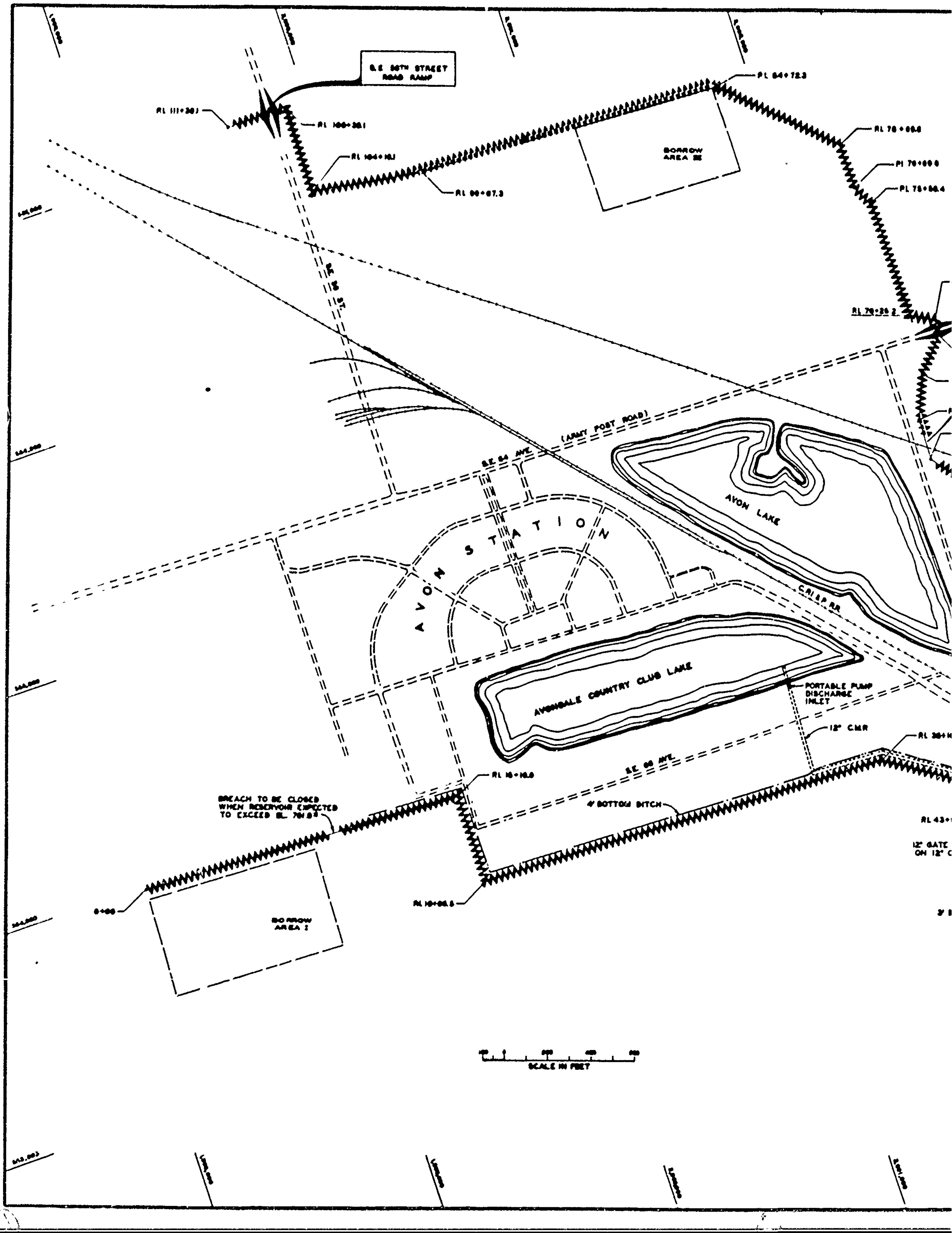
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

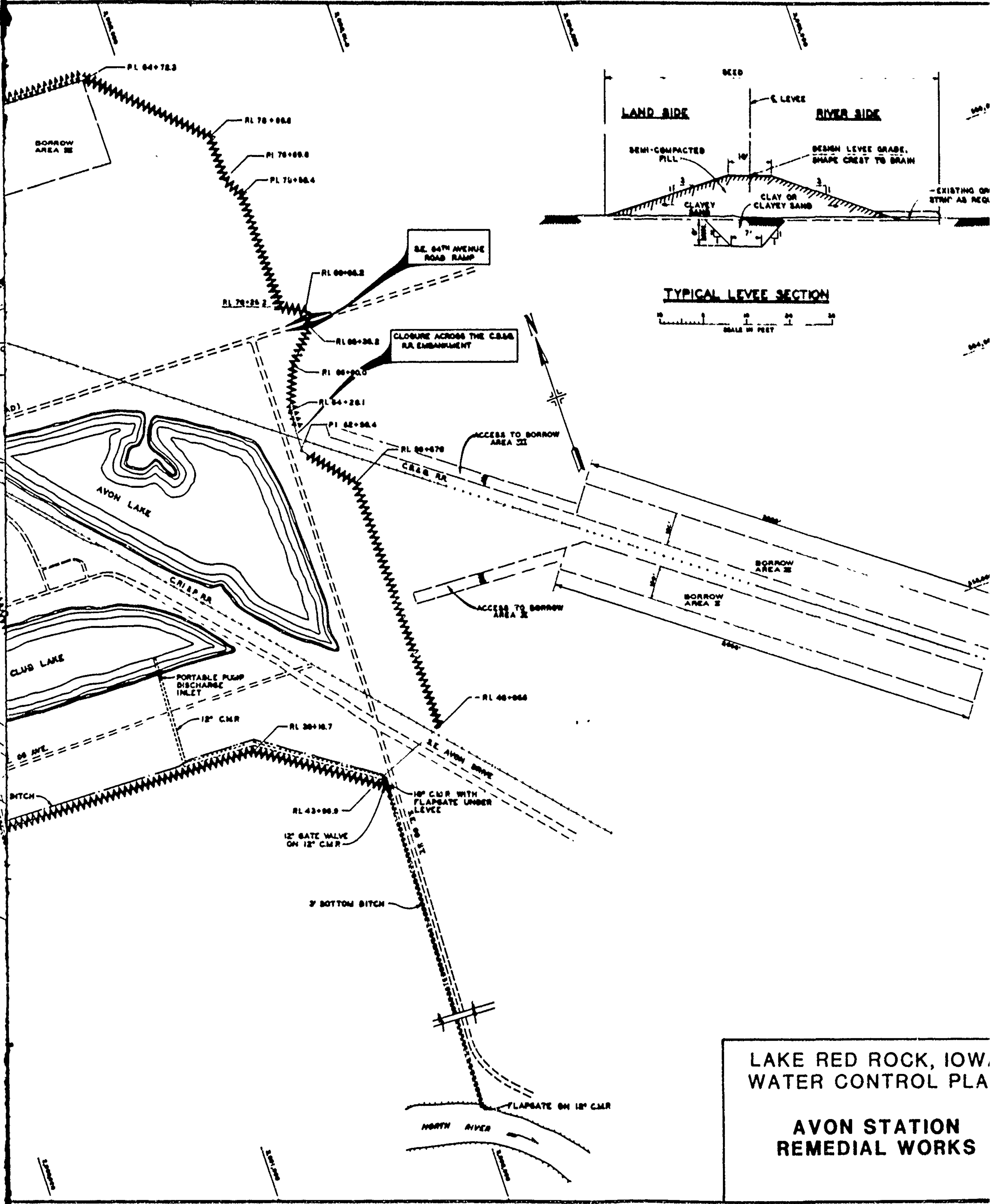
GENERAL LOCATION

PLATE 1


55
VICINITY MAP
MINNESOTA
WIS.
IOWA
PROJECT LOCATION
SIOUX CITY
COUNCIL BLUFFS
DES MOINES
DAVENPORT
DUBUQUE
ROCK ISLAND
KEOKUK
OMAHA
NEBR.
ILL.
MISSOURI
KAN.
SCALE IN MILES
Y.W.C.A CAMP
BARKLEY MEMORIAL STATE MONUMENT PARK
Fraser
Y.M.C.A CAMP
HOLST STATE FOREST RESERVE
GIRL SCOUT CAMP CAMP MOINGONA
Logansport
Boone
C & N W.
BOONE COUNTY
STORY COUNTY
CAMP FIRE GIRLS CAMP CAMP HANTESA
THE LEDGES STATE PARK
C.M.ST.P. & P. RR.
FORT DODGE, DES MOINES & SOUTHERN RR.
Luther
BOY SCOUT CAMP CAMP MITIGWA
IOWA 4-H FOUNDATION
I O W A
FULL FLOOD CONTROL POOL EL 8900
PRAIRIE CREEK
BIG CREEK
DES MOINES
STATE SCHOOL & HOSPITAL
Madrid
C.M.ST.P. & P. RR
Slater
BOONE CO.
DALLAS CO.
Woodward
STORY COUNTY
POLK COUNTY
Sheldahl
LITTLE CREEK
RIVER
BIG CREEK LAKE POOL ELEV 9200
DIVERSION DAM
CHANNEL
JESTER COUNTY PARK
Polk City
BARRIER DAM
CONSERVATION POOL EL 8330
Granger
DES MOINES & CENTRAL IOWA RR.
DALLAS COUNTY
POLK COUNTY
CAMP DODGE
Ankeny
SAYLORVILLE DAM
Saylorville
SAYLORVILLE LAKE AREA
SCALE IN MILES
LEGEND
INTERSTATE HIGHWAYS
U. S. HIGHWAYS
STATE HIGHWAYS
COUNTY ROADS
PAVED ROADS
GRAVELED ROADS
RIVER MILEAGE ORIGINATES AT MOUTH OF DES MOINES RIVER.
LAKE RED ROCK, IOWA
WATER CONTROL PLAN
SAYLORVILLE LAKE
FLOOD CONTROL
PROJECT

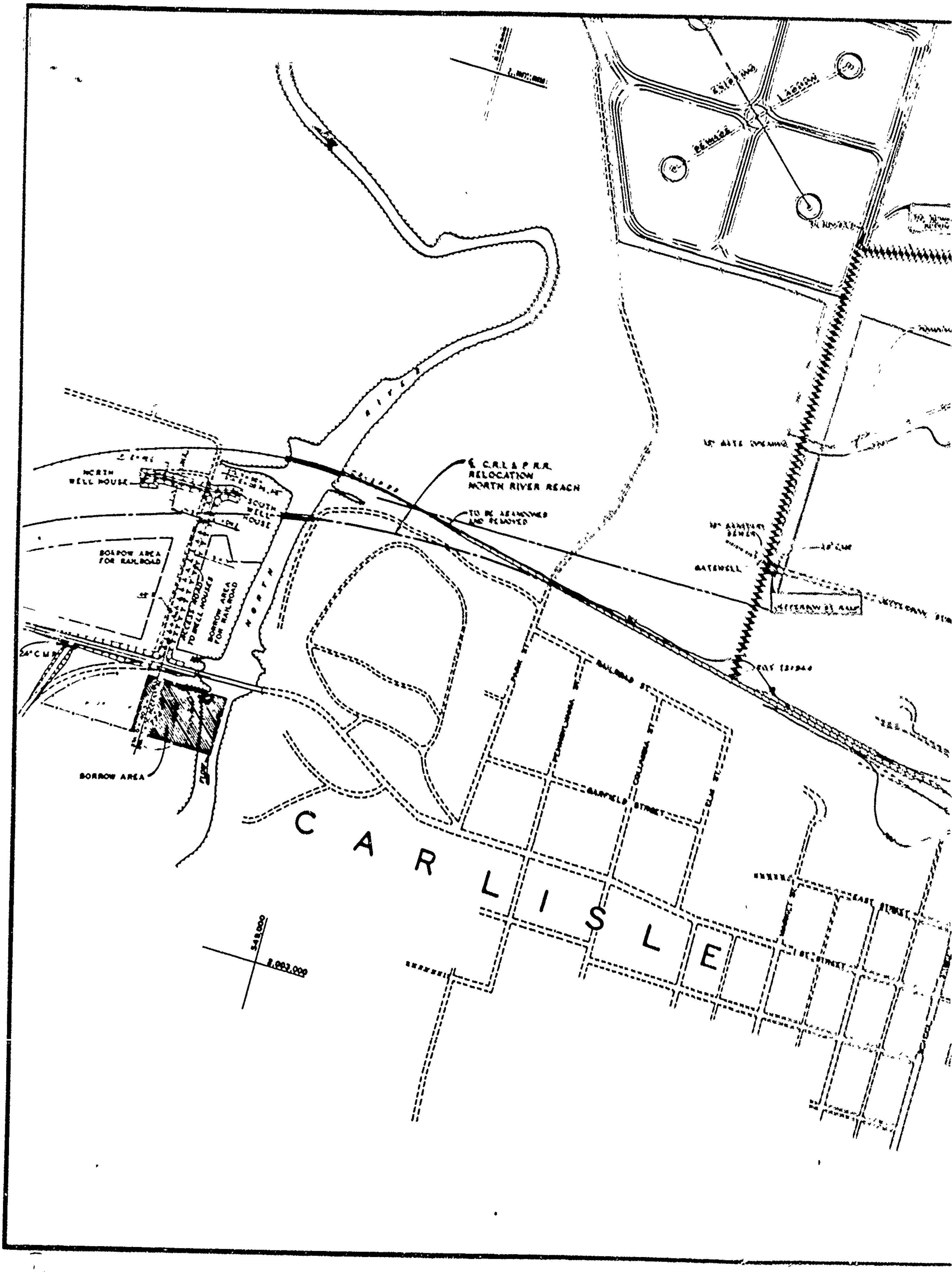
CORPS OF ENGINEERS



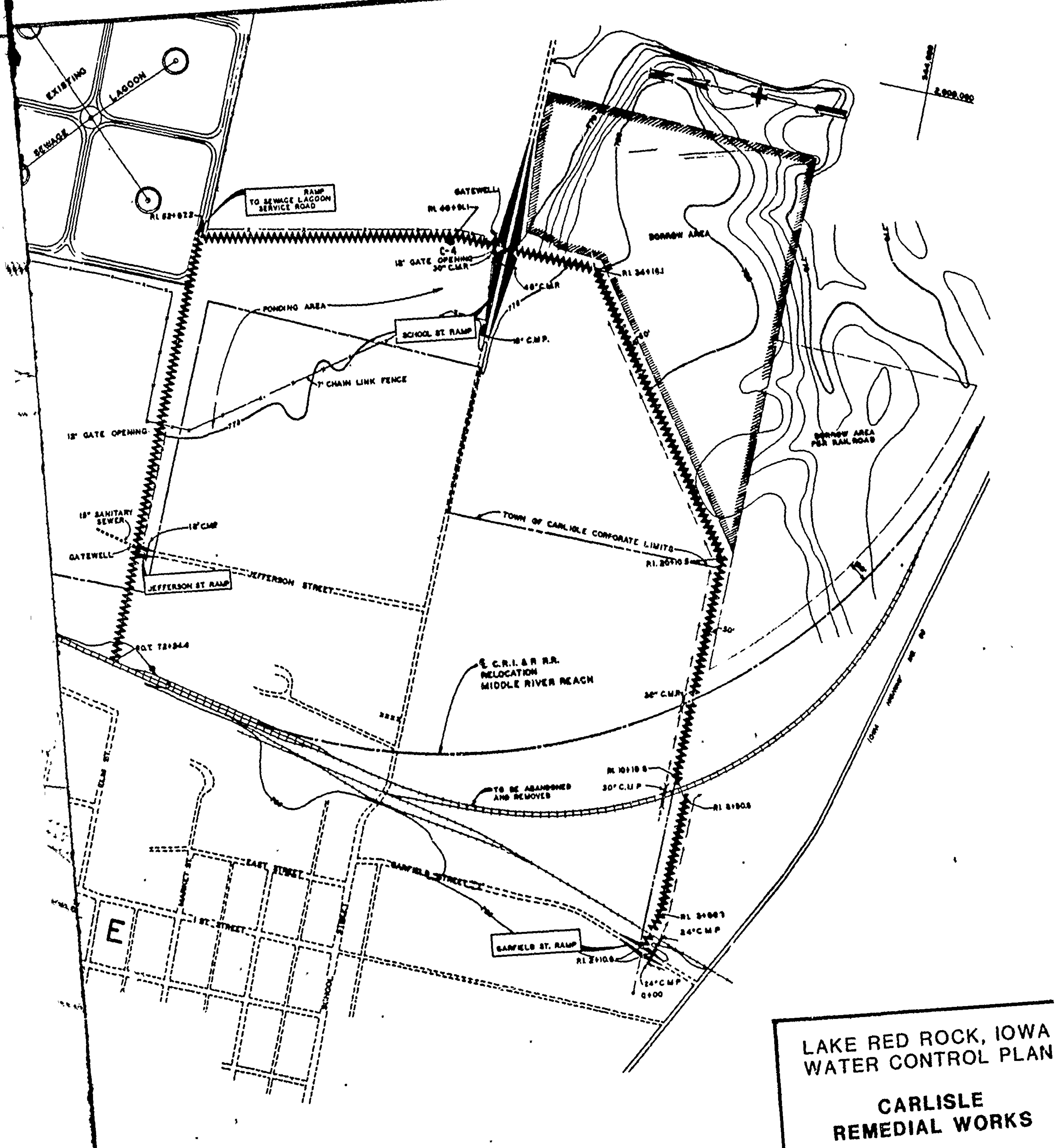


LAKE RED ROCK, IOW
WATER CONTROL PLA

AVON STATION
REMEDIAL WORKS



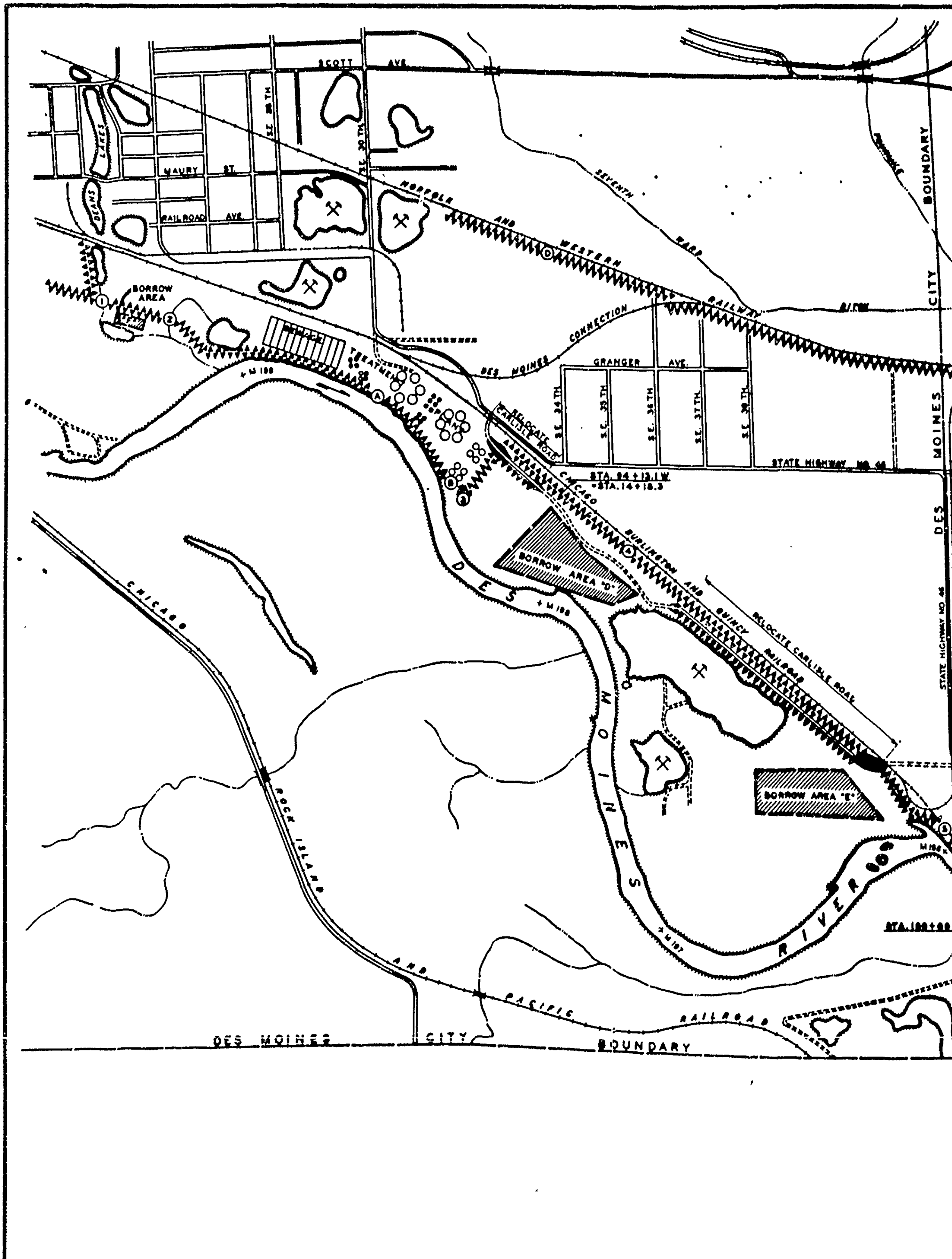
C.R.I. & P.R.R. RELOCATION NORTH RIVER REACH
TO BE ABANDONED AND REMOVED
NORTH WELL HOUSE
SOUTH WELL HOUSE
BORROW AREA FOR RAILROAD
BORROW AREA FOR RAILROAD
BORROW AREA
RAILROAD ST
GARFIELD STREET
GATEWELL
CARLISLE



LAKE RED ROCK, IOWA
WATER CONTROL PLAN

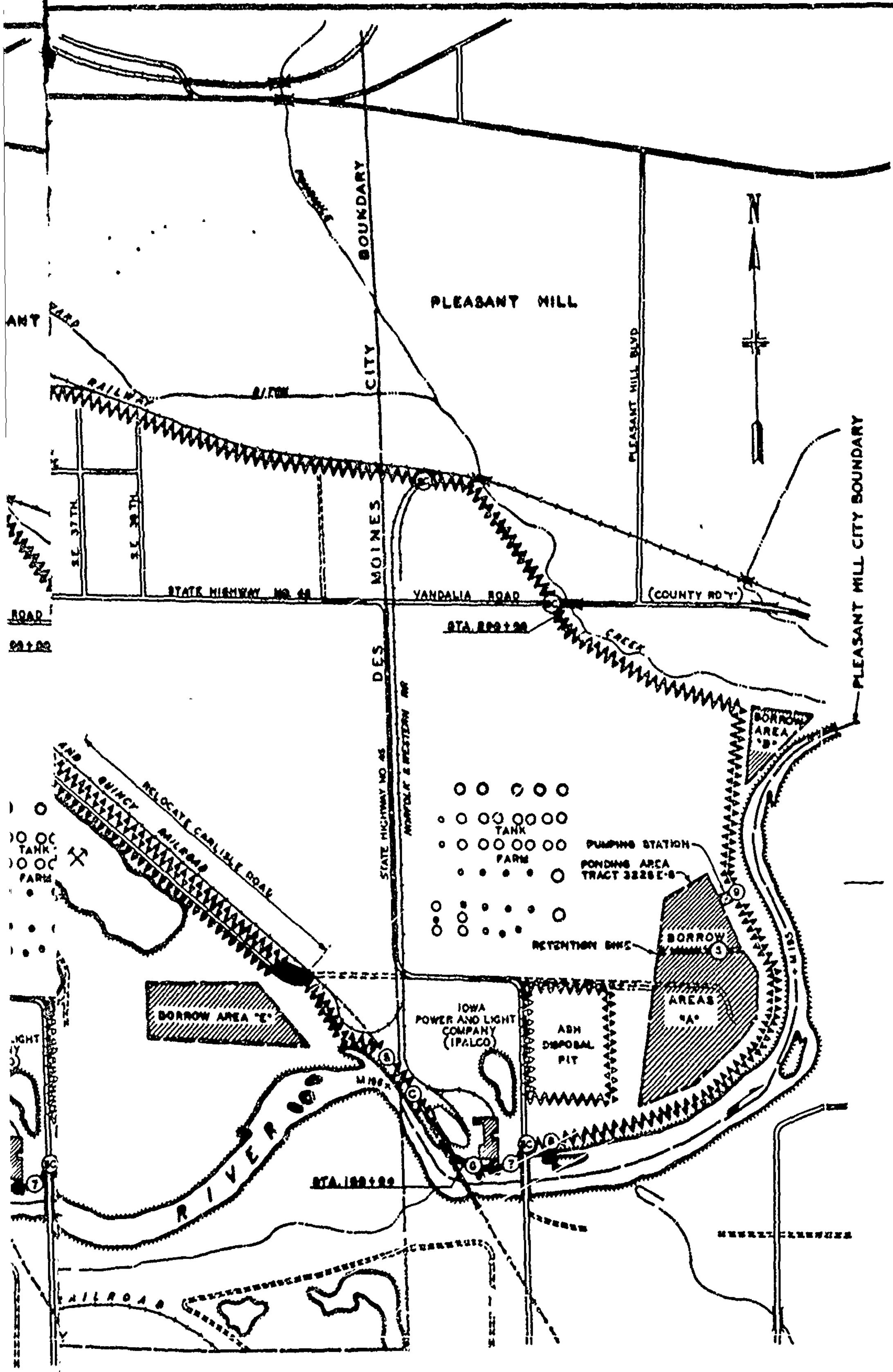
CARLISLE
REMEDIAL WORKS

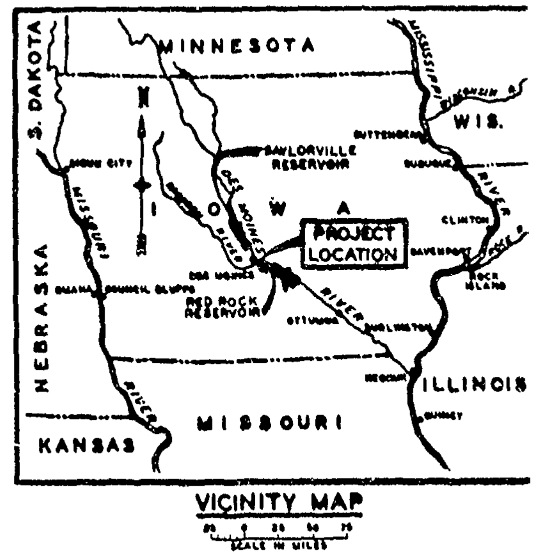
PLATE


SCOTT AVE.
S.E. 28TH
S.E. 30TH
LAKES
MAURY ST.
DEANS
RAILROAD AVE.
NORFOLK AND WESTERN RAILWAY
SEVENTH WARD
BORROW AREA
DES MOINES CONNECTION
GRANGER AVE.
S.E. 34TH
S.E. 35TH
S.E. 36TH
S.E. 37TH
S.E. 38TH
RELOCATE CARLISLE ROAD
STATE HIGHWAY NO. 46
STA. 94+13.1 W
=STA. 14+18.3
CHICAGO BURLINGTON AND QUINCY RAILROAD
RELOCATE CARLISLE ROAD
BORROW AREA "D"
BORROW AREA "E"
+ M 198
+ M 197
DES MOINES RIVER
CHICAGO ROCK ISLAND AND PACIFIC RAILROAD
DES MOINES CITY BOUNDARY
DES MOINES CITY BOUNDARY
STATE HIGHWAY NO 46

(2)

U. S. ARMY





VICINITY MAP

LEGEND:

- TUNNEL CLOSURE STRUCTURE
- (A) GATEWELL
- (4) GRAVITY OUTLET
- NEW FLOODWALL
- EXISTING LEVEE
- IMPROVED LEVEE
- NEW LEVEE
- ROAD R. IP
- (S) SLURRY WATER STRUCTURE
- (SC) SANDBAG CLOSURE

GENERAL NOTES:

1. ELEVATIONS IN FEET ABOVE M.S.L. DATUM OF 1929
2. RIVER MILEAGE REFERS TO DISTANCE ABOVE MOUTH OF DES MOINES RIVER.

OPERATION SCHEDULE

OPERATED BY THE CITY OF DES MOINES

GRAVITY OUTLETS	1,2,3 & 4
GATEWELLS	A,B & D

OPERATED BY IPALCO

SCREEN HOUSE DISCHARGE TUNNEL COOLING TOWER PIT YARD DRAINS	SEE EXHIBIT A OF IPALCO AGREEMENT (APPENDIX H)
PUMPING STATION	
GRAVITY OUTLETS	5,6,7,8 & 9
GATEWELL	C
SANDBAG CLOSURES	HIGHWAY 46 VANDALIA ROAD NORFORK & WESTERN RR

OPERATED BY THE GOVERNMENT

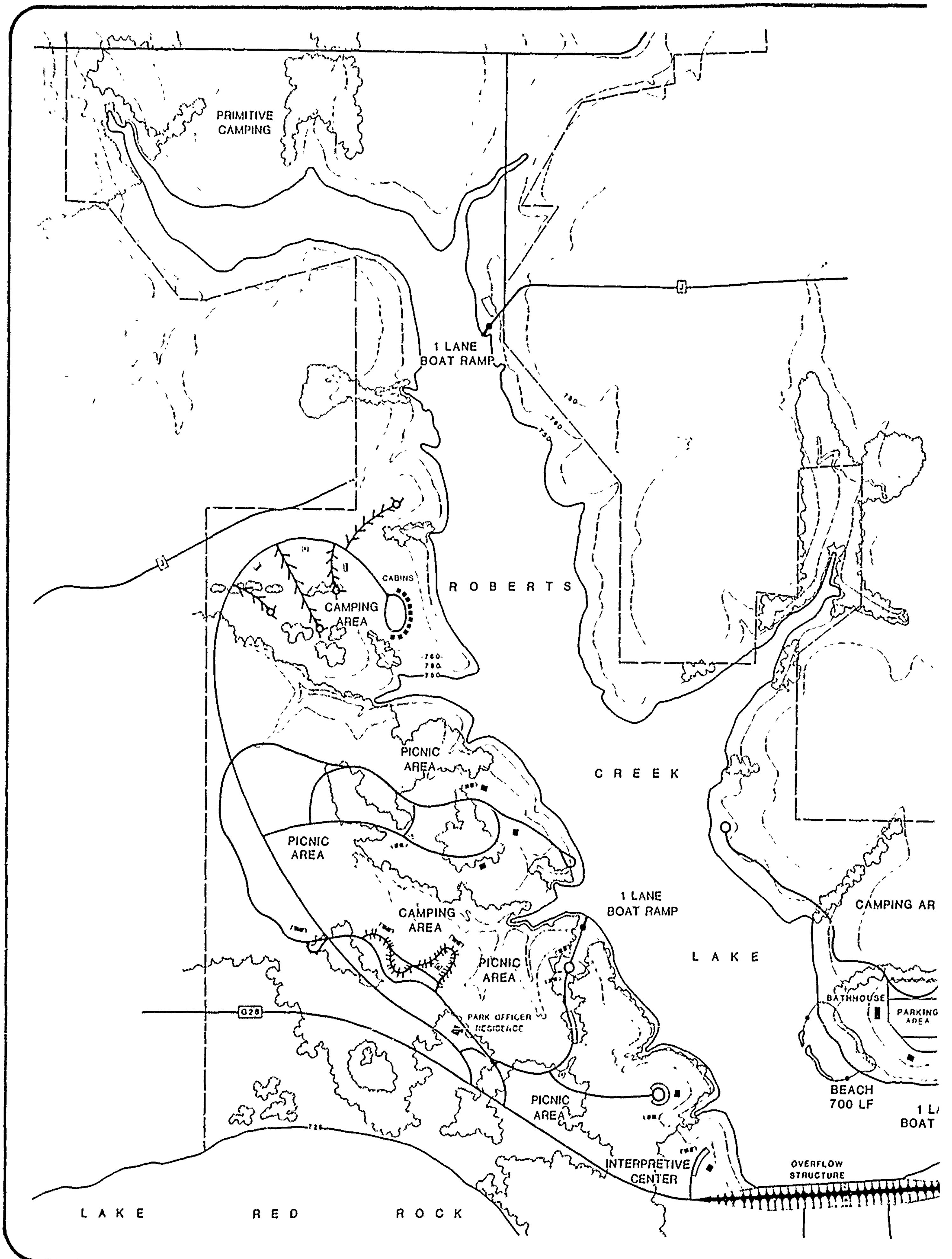
ALL LEVEES AND FLOODWALLS

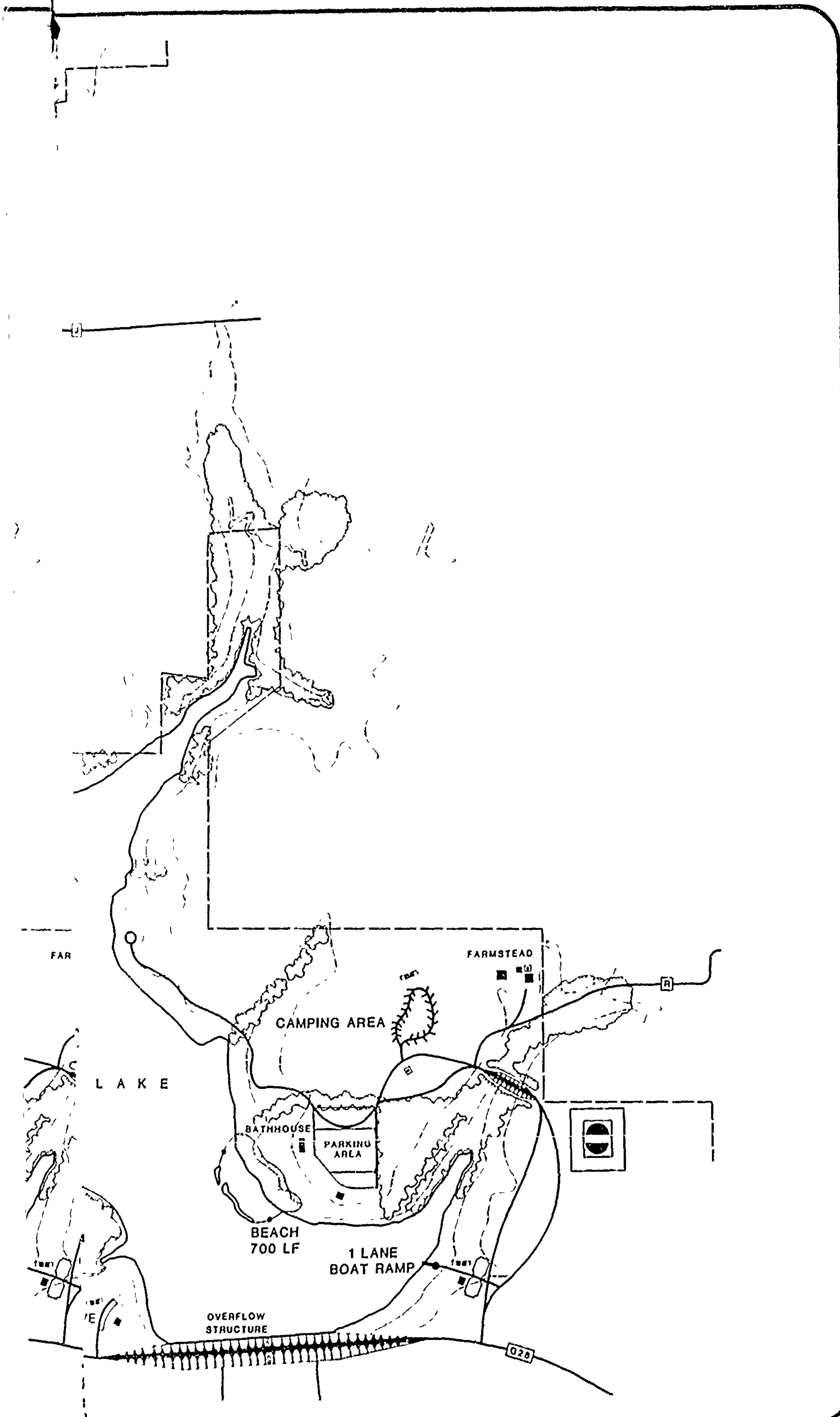
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

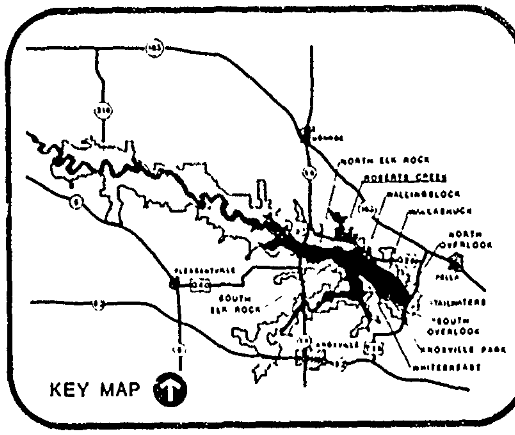
SOUTHEAST DES MOINES REMEDIAL WORKS

PLATE

(2)


PRIMITIVE CAMPING
1 LANE BOAT RAMP
CABINS
CAMPING AREA
ROBERTS
CREEK
LAKE
PICNIC AREA
PICNIC AREA
CAMPING AREA
1 LANE BOAT RAMP
PICNIC AREA
PARK OFFICER RESIDENCE
PICNIC AREA
INTERPRETIVE CENTER
OVERFLOW STRUCTURE
CAMPING AR
BATHHOUSE
PARKING AREA
BEACH 700 LF
1 L
BOAT
G28
J
LAKE RED ROCK





LEGEND

- Project Boundary
- Recreation Boundary
- Conservation Pool
- Five Year Flood Pool
- Flood Pool
- Existing Timber
- Existing State or County Roads

FACILITY DEVELOPMENT

EXISTING

- Project Roads and Parking
- Camping Spurs
- Boat Launching Ramp
- Foot Trail
- Swimming Beach
- Trailer Dumping Station
- Amphitheater
- Picnic Shelter
- Entrance Station
- Bath-Change Shelter
- Comfort Station
- Washhouse
- Vault Toilet
- Fish Cleaning Station
- Sewage Lift Station
- Sewage Lagoon
- Sewers, Electrical or Waterline
- Water Supply
- Facility to be Obliterated

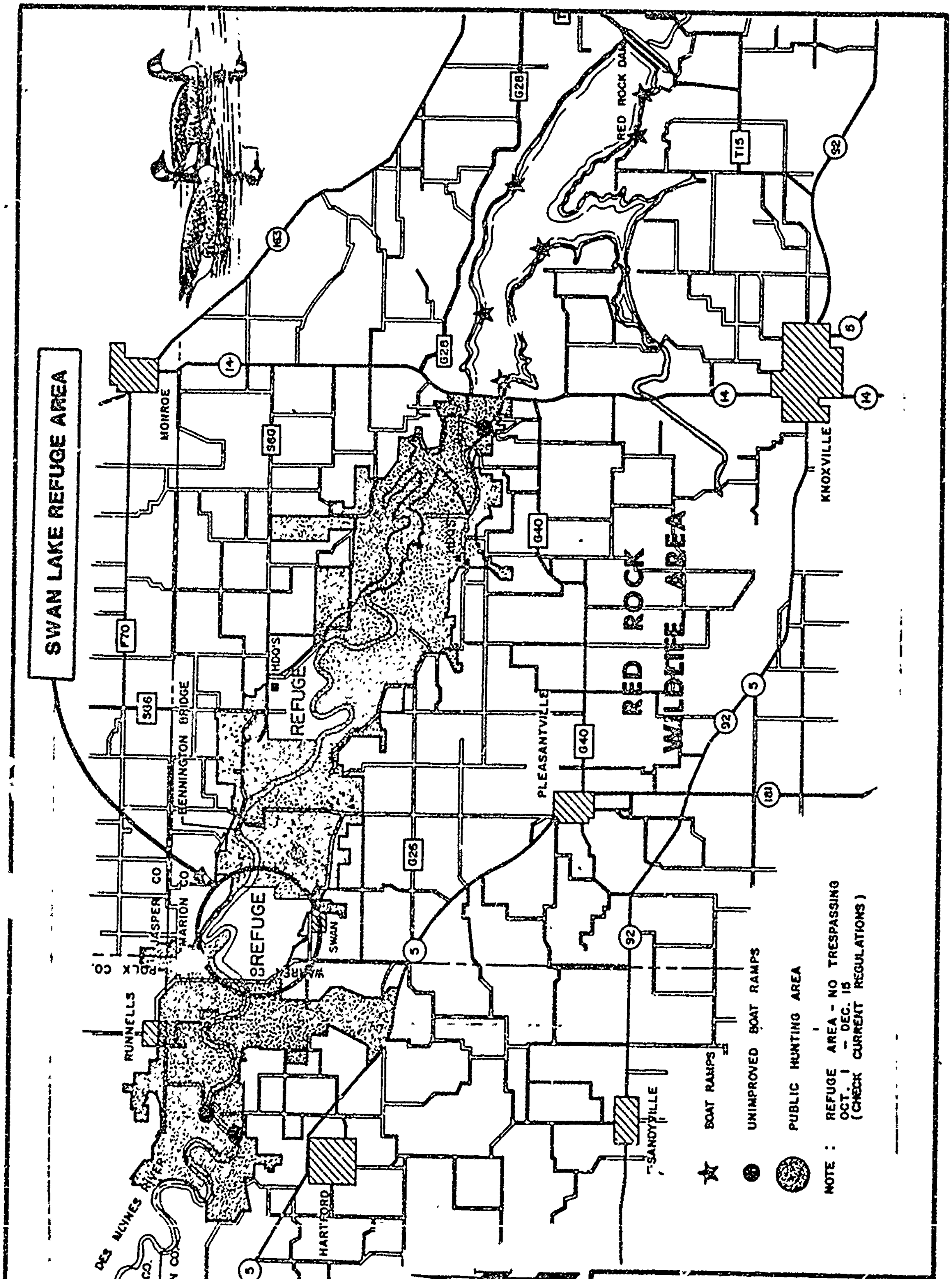
NORTH

400	800	1200	1600	2000

SCALE IN FEET

LAKE RED ROCK, IOWA
WATER CONTROL PLAN

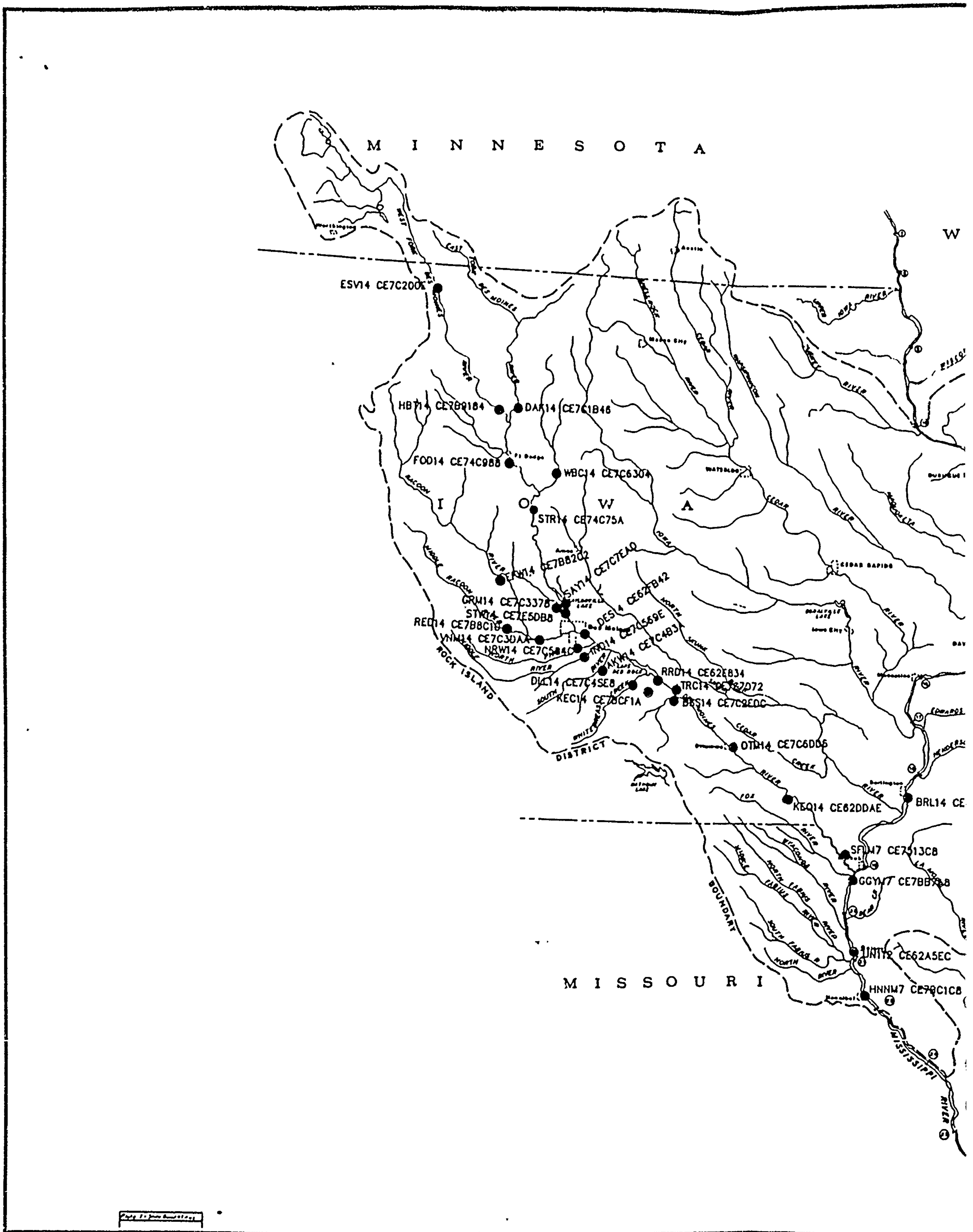
ROBERTS CREEK COUNTY PARK



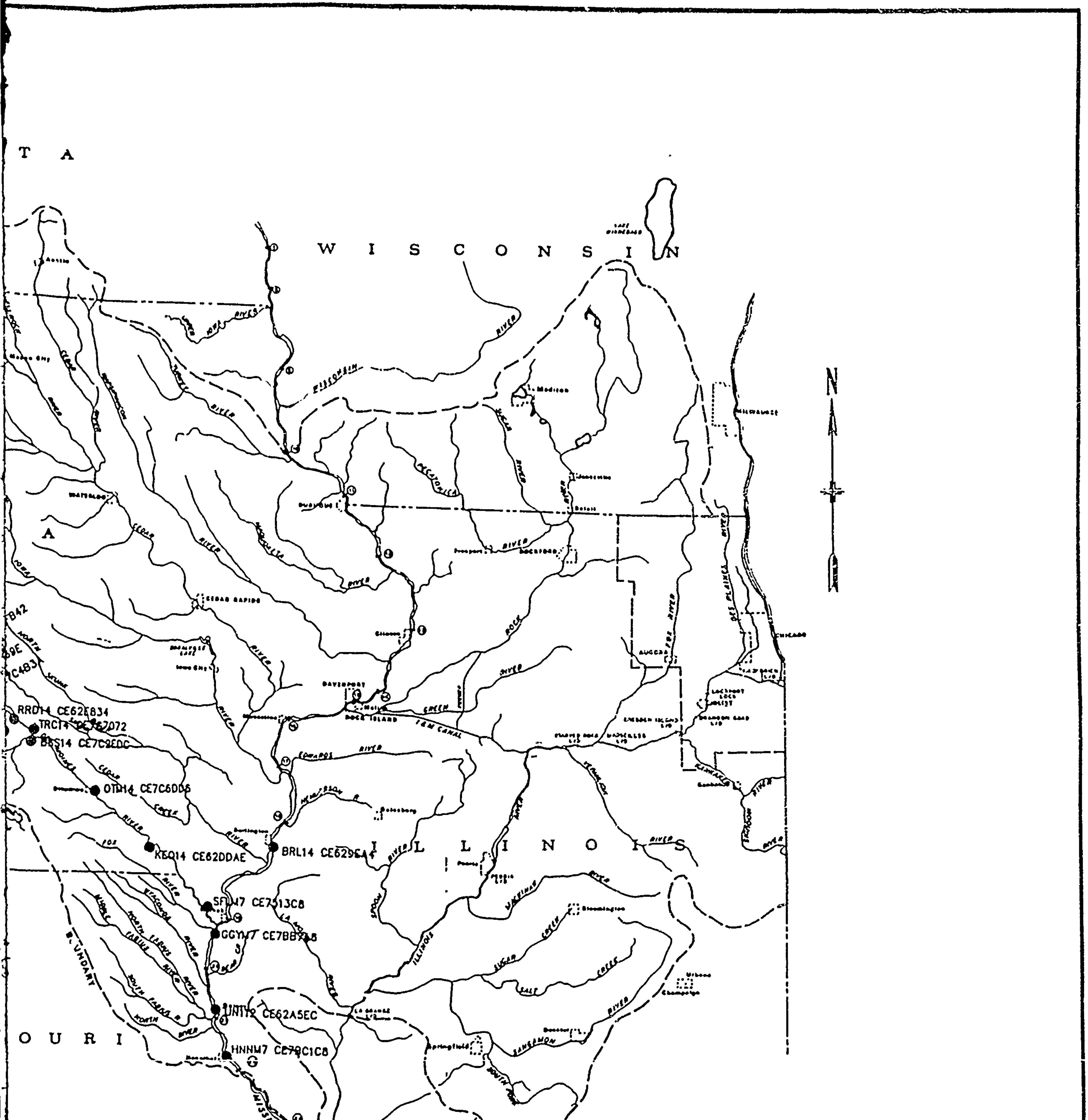
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

WILDLIFE MANAGEMENT AREA

PLATE 7

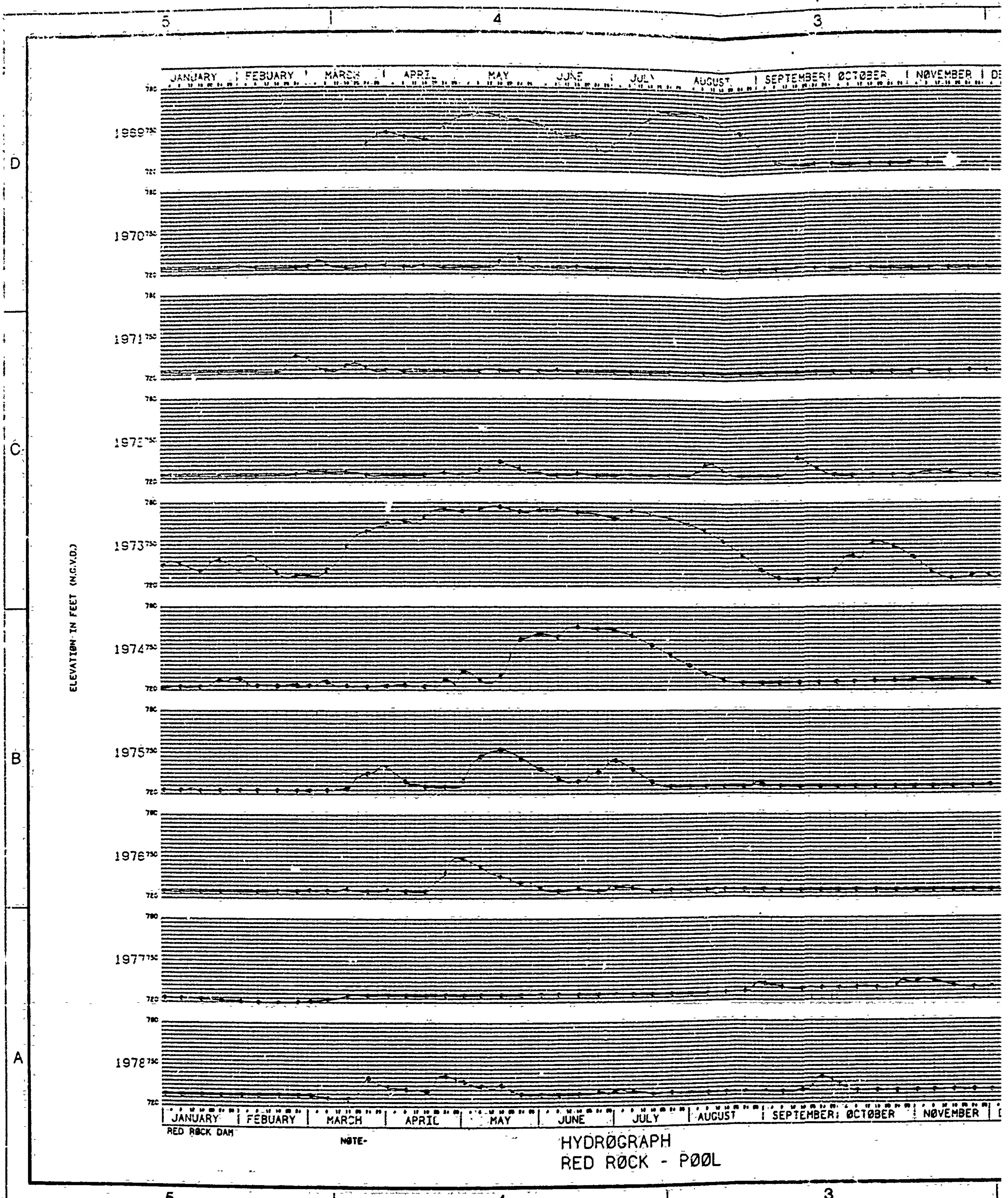


MINNESOTA
IOWA
MISSOURI
ESV14 CE7C2002
DAK14 CE7C1B46
FOD14 CE74C988
WBC14 CE7C6304
STR14 CE74C75A
GRM14 CE7C3378
DES14 CE62FB42
BRL14
OTM14 CE7C6DD6
KEO14 CE62DDAE
UNIY2 CE62A5EC
HNNM7 CE79C1C8
ROCK ISLAND DISTRICT BOUNDARY
MISSISSIPPI RIVER

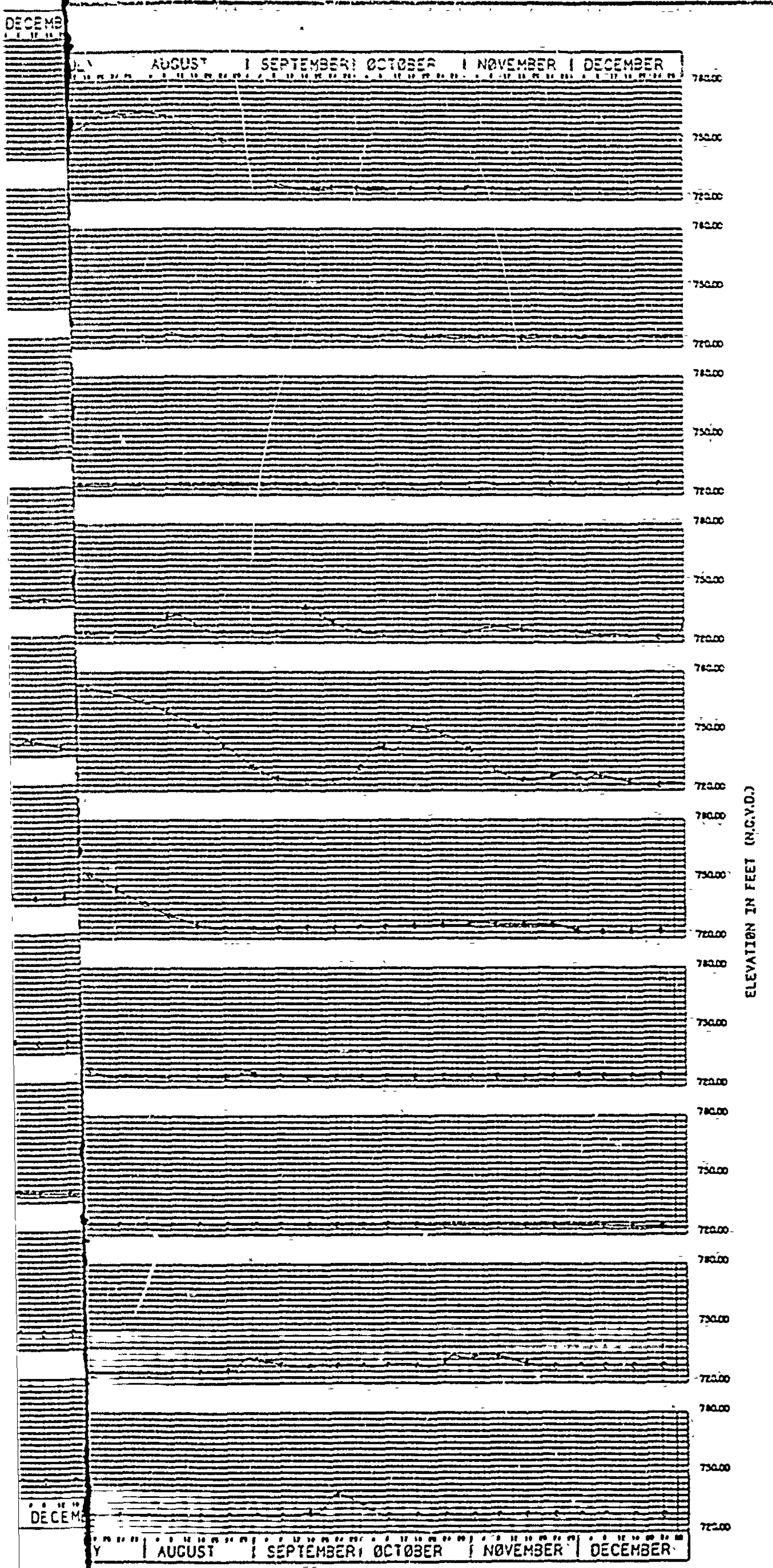


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

AUTOMATED HYDRAULIC NETWORK



5
4
3
D
C
B
A
JANUARY
FEBUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
ØCTØBER
NØVEMBER
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
780
750
720
ELEVATIØN IN FEET (N.G.V.D.)
RED RØCK DAM
NØTE-
HYDRØGRAPH
RED RØCK - PØØL

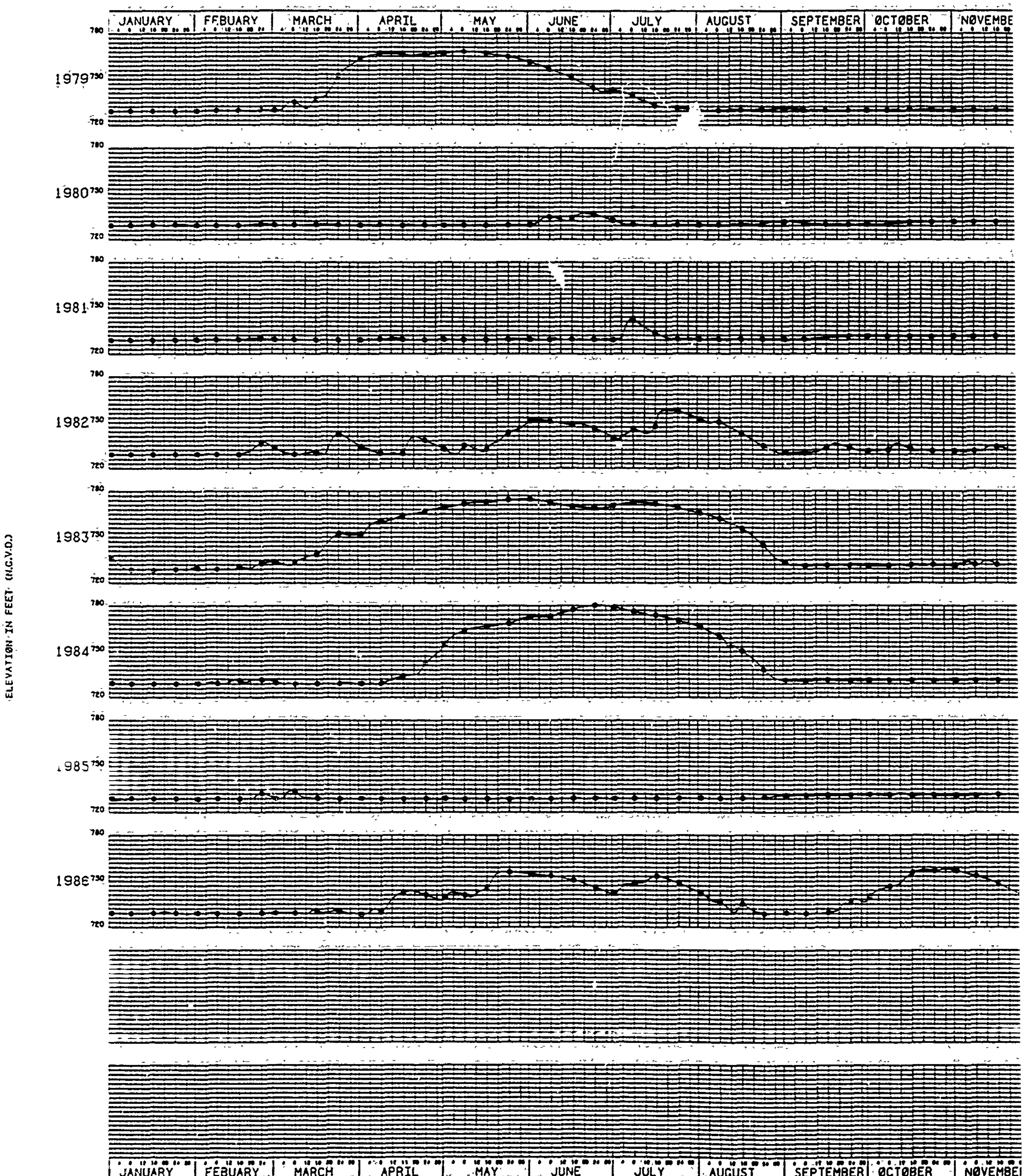


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

RED ROCK RESERVOIR
POOL-STAGE HYDROGRAPHS
1969-1978

PLATE 9

5 4 3



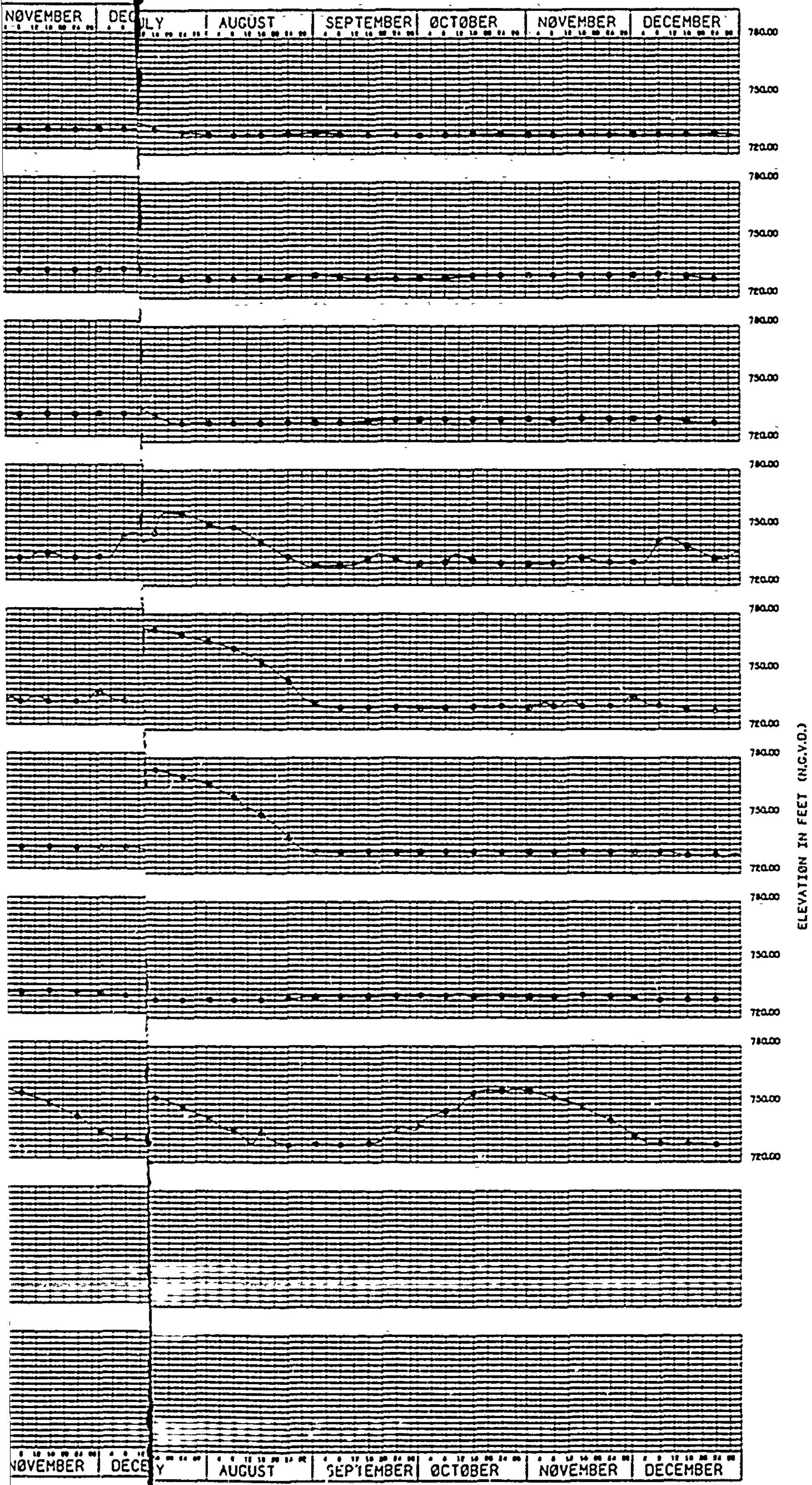
RED RØCK DAM

NØTE-

HYDRØGRAPH
RED RØCK - PØØL

5 4 3

3 | 2 | 1



PH
- PØØL

LAKE RED ROCK, IOWA
WATER CONTROL PLAN

RED ROCK RESERVOIR
POOL-STAGE
HYDROGRAPHS
1979-1986

3 | 2 | 1

PLATE

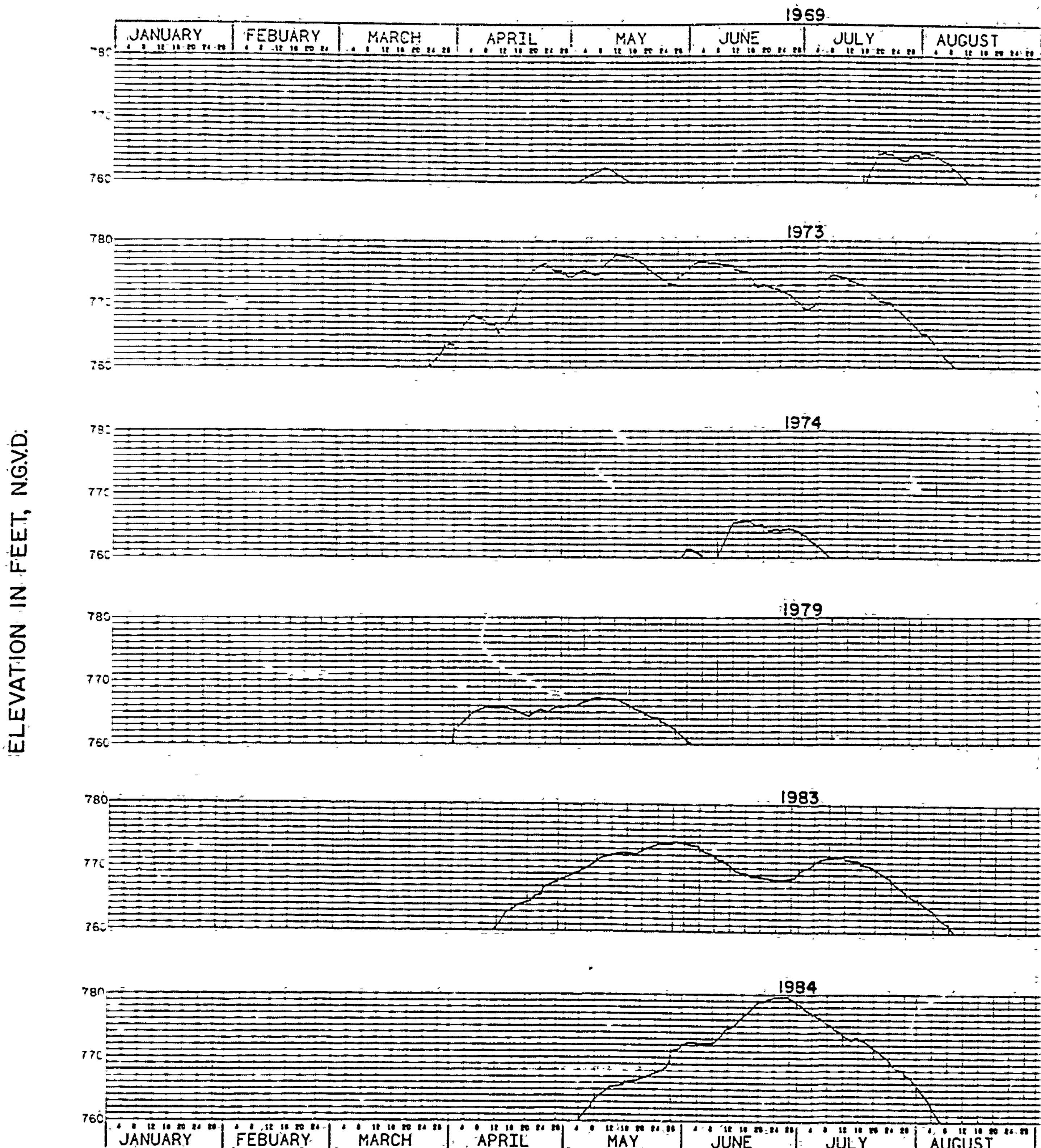
5 4 3

D

C

B

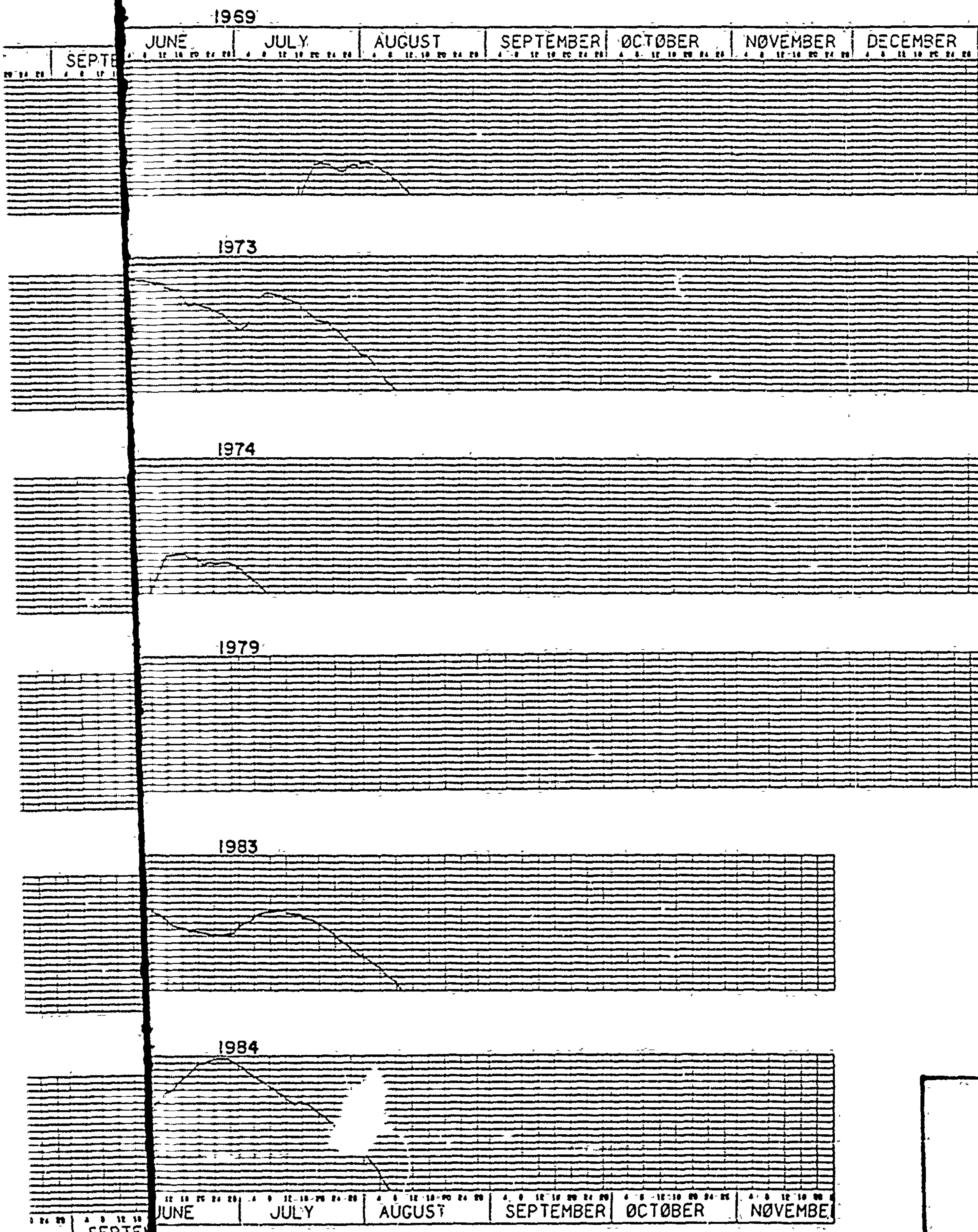
A



5 4 3

①

②

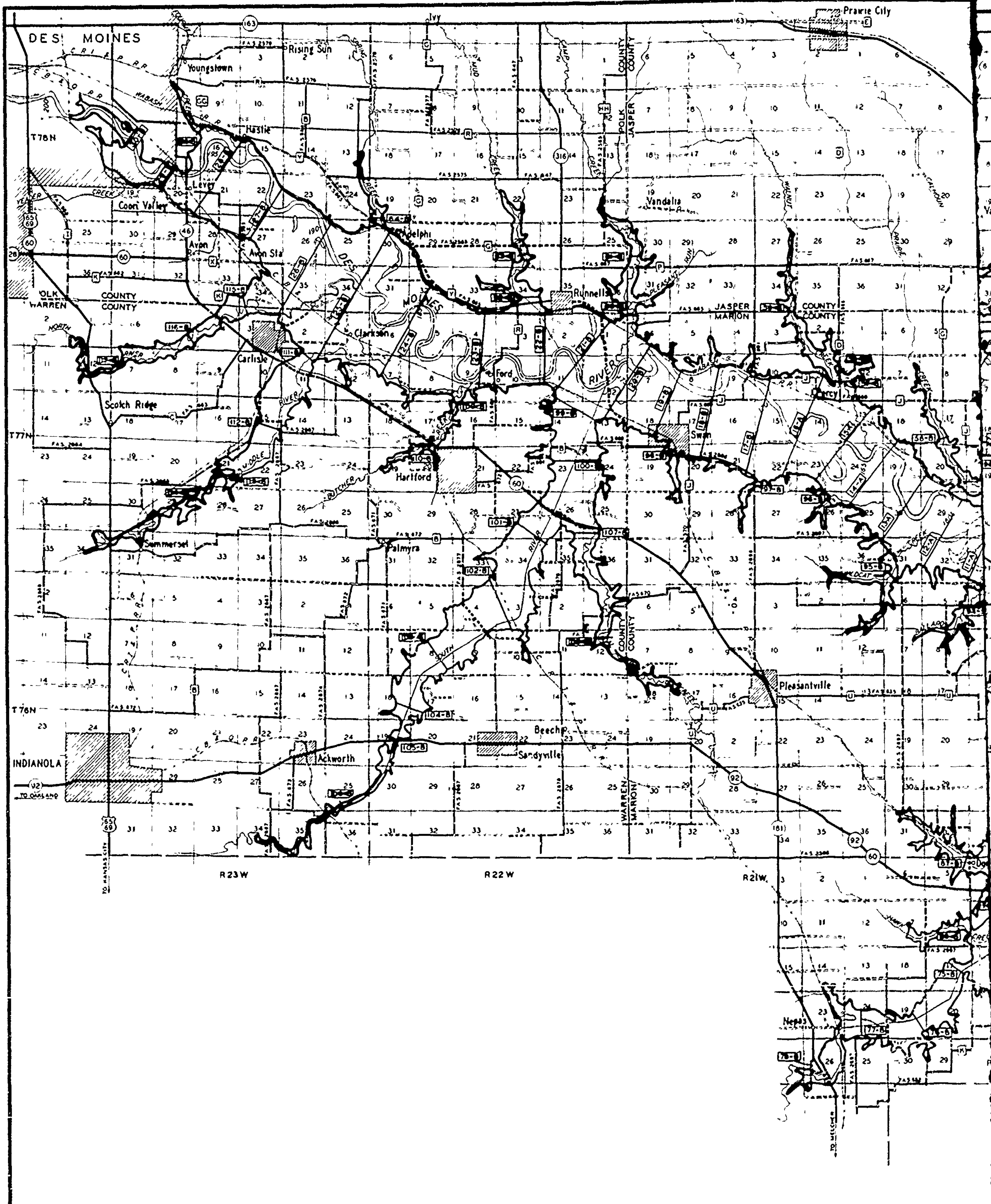


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

FLOODS ABOVE ELEVATION 760

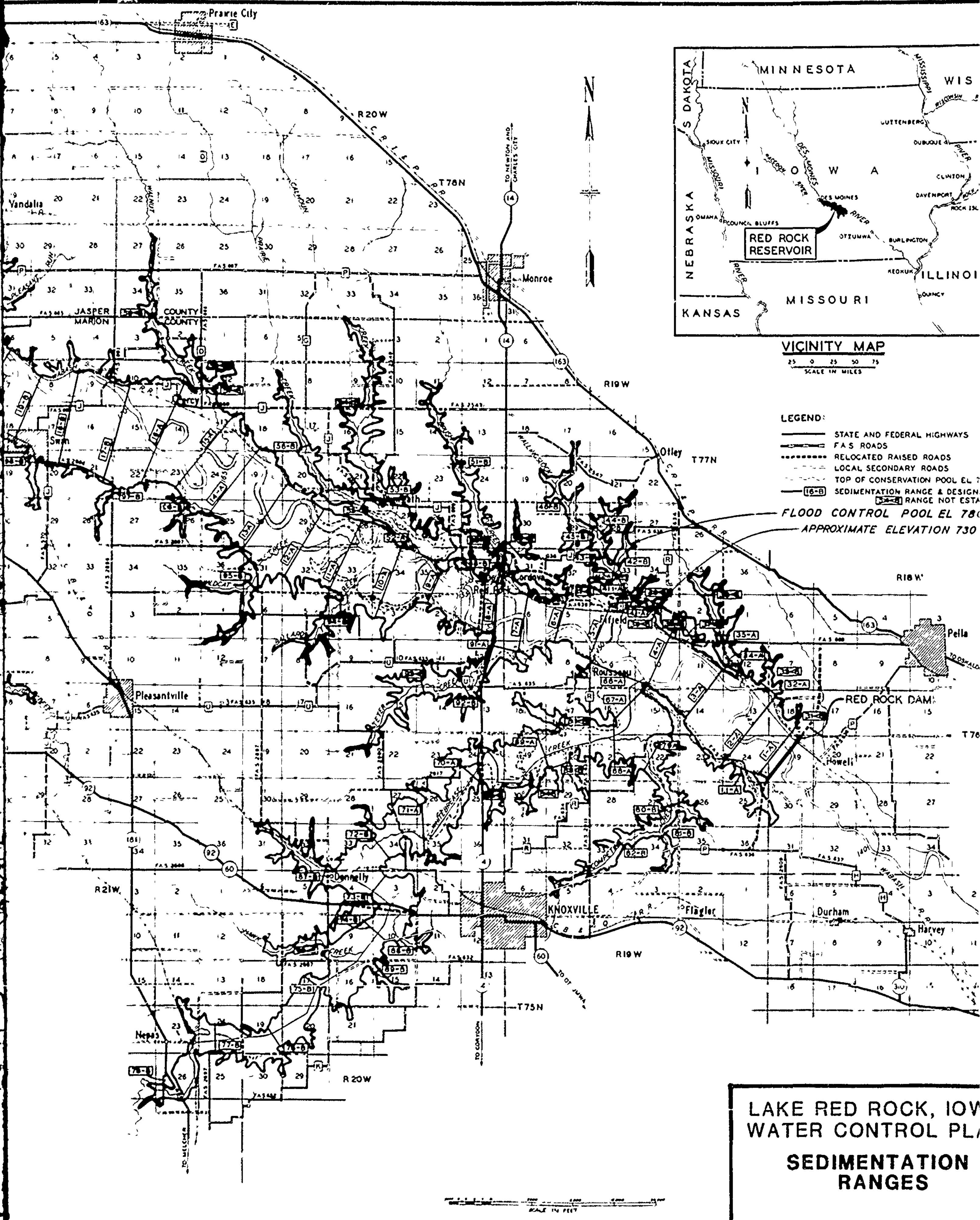
PLATE 11

(2)


DES MOINES
Ivy
Prairie City
Rising Sun
Youngstown
Hastie
Levey
Coon Valley
Avon
Avon Sta
Adelphi
Vandalia
Runnells
POLK COUNTY
JASPER COUNTY
POLK COUNTY
WARREN COUNTY
JASPER COUNTY
MARION COUNTY
Clarkson
Carlisle
Ford
Scotch Ridge
Swan
Hartford
Palmyra
Summerset
Pleasantville
Beech
Sandyville
Ackworth
INDIANOLA
WARREN COUNTY
MARION COUNTY
T78N
T77N
T76N
R23W
R22W
R21W
DES MOINES RIVER
MIDDLE RIVER
SOUTH RIVER
NORTH RIVER
Neges

(1)

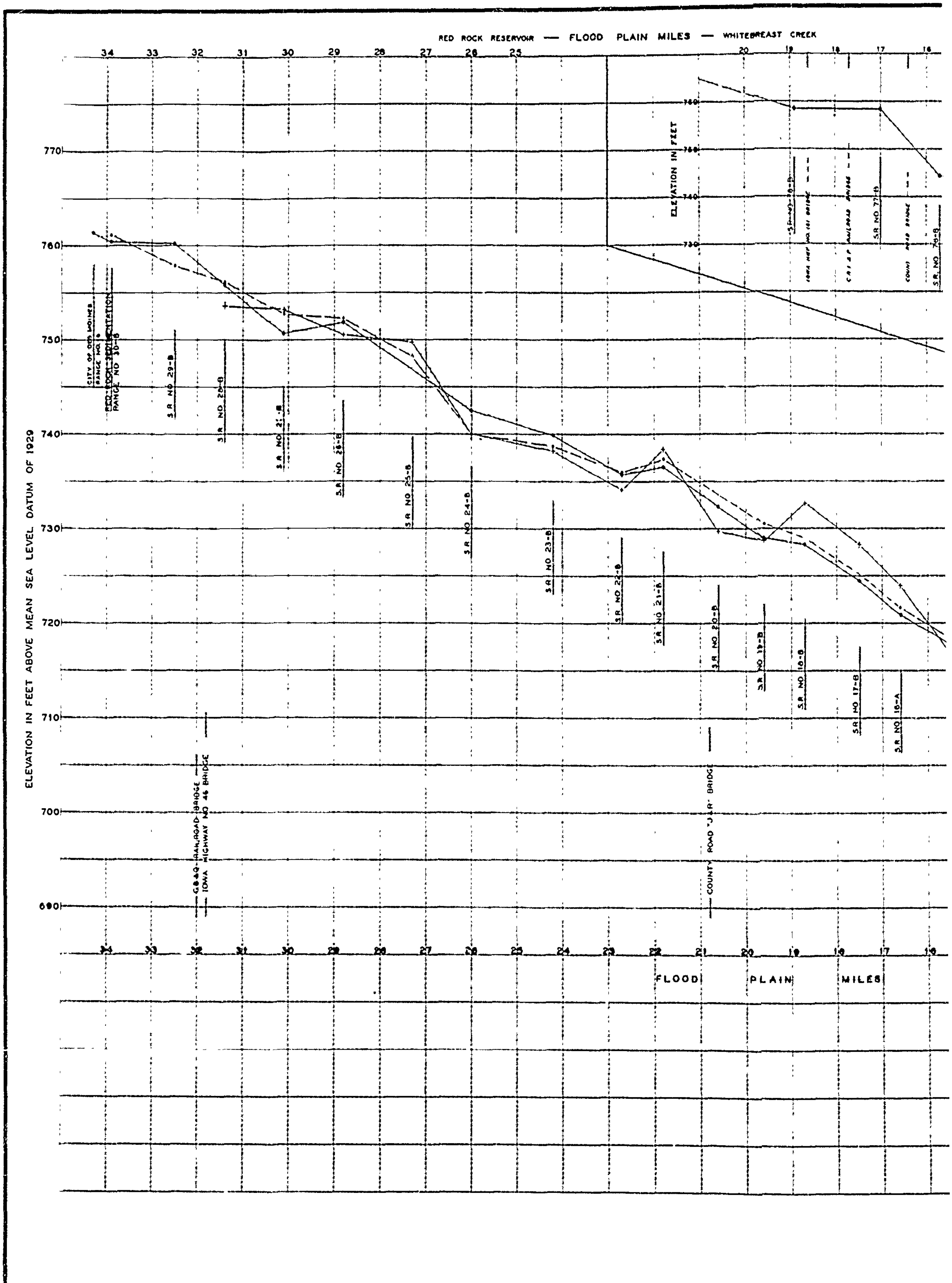
U. S. ARI

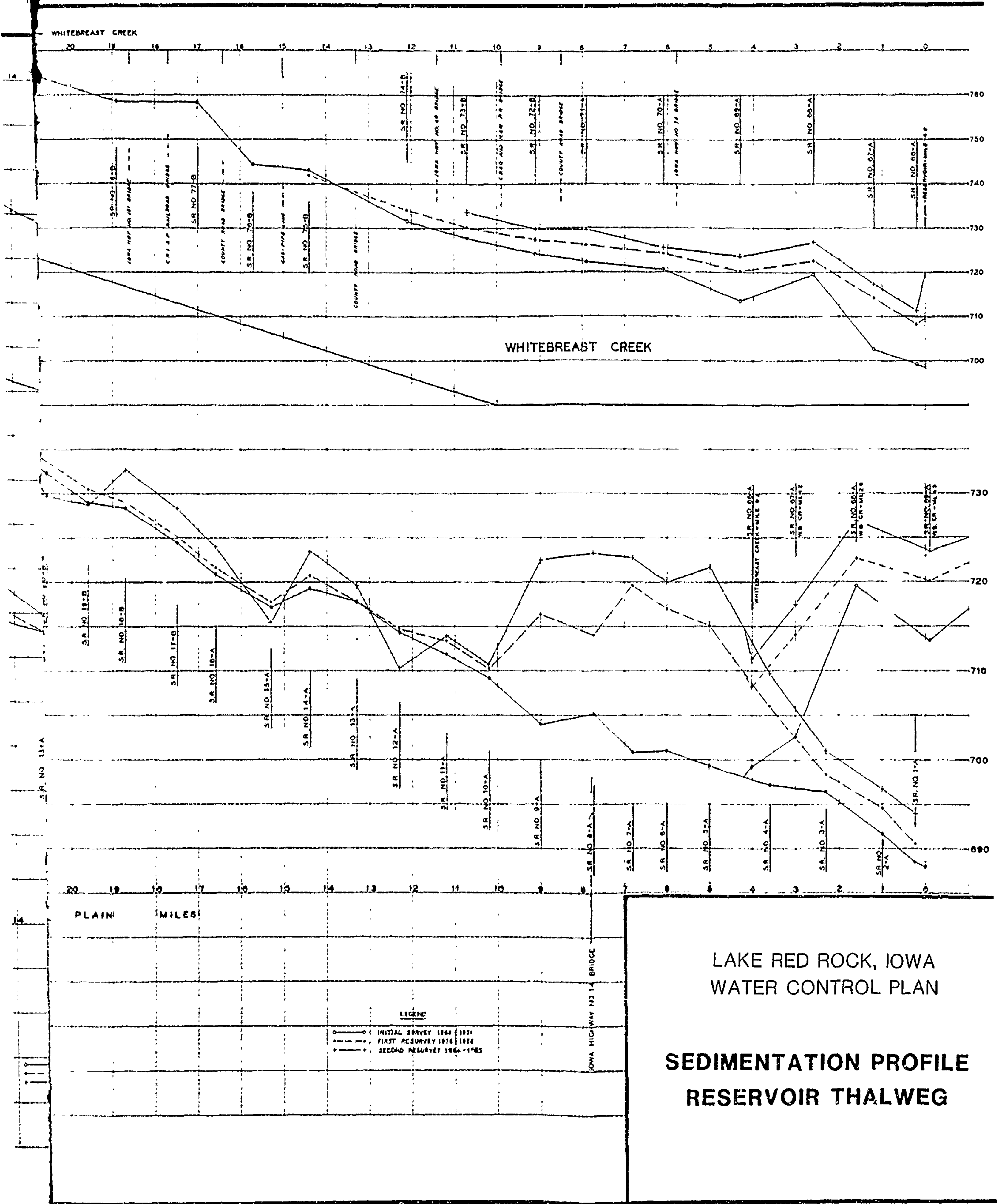


LAKE RED ROCK, IOW
WATER CONTROL PL

SEDIMENTATION RANGES

PLATE

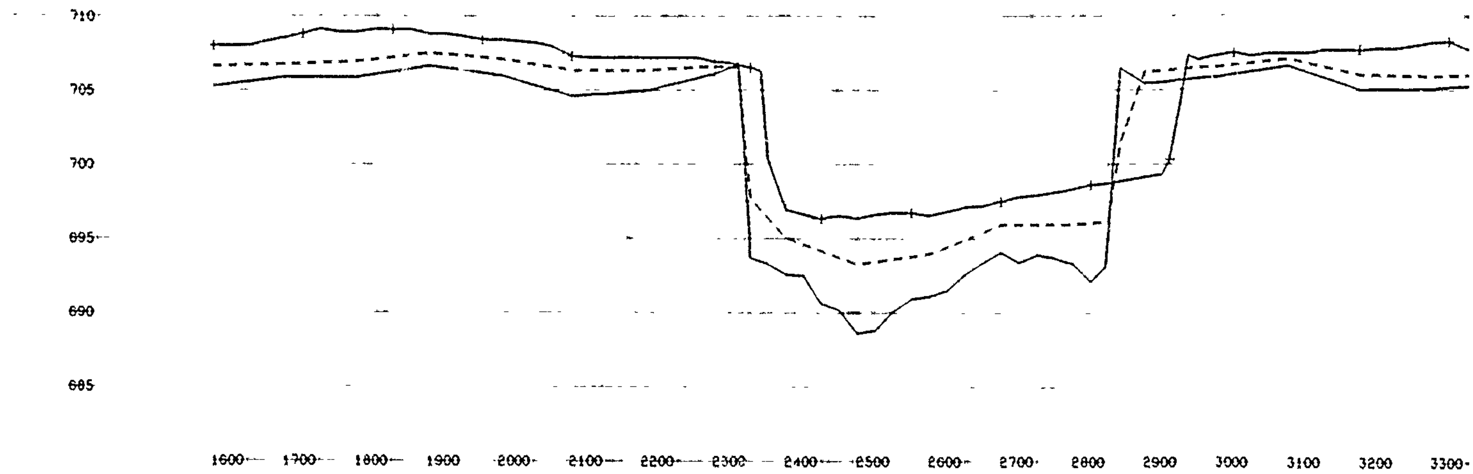

RED ROCK RESERVOIR — FLOOD PLAIN MILES — WHITEBREAST CREEK
ELEVATION IN FEET ABOVE MEAN SEA LEVEL DATUM OF 1929
ELEVATION IN FEET
770
760
750
740
730
720
710
700
690
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
FLOOD PLAIN MILES
CITY OF DES MOINES RANGE NO. 6
S.R. NO 29-B
S.R. NO 28-B
S.R. NO 27-B
S.R. NO 26-B
S.R. NO 25-B
S.R. NO 24-B
S.R. NO 23-B
S.R. NO 22-B
S.R. NO 21-B
S.R. NO 20-B
S.R. NO 19-B
S.R. NO 18-B
S.R. NO 17-B
S.R. NO 16-A
C.B.&Q. RAILROAD BRIDGE
IOWA HIGHWAY NO 46 BRIDGE
COUNTY ROAD "J-R" BRIDGE
C.R.I.&P. RAILROAD BRIDGE
COUNTY ROAD BRIDGE



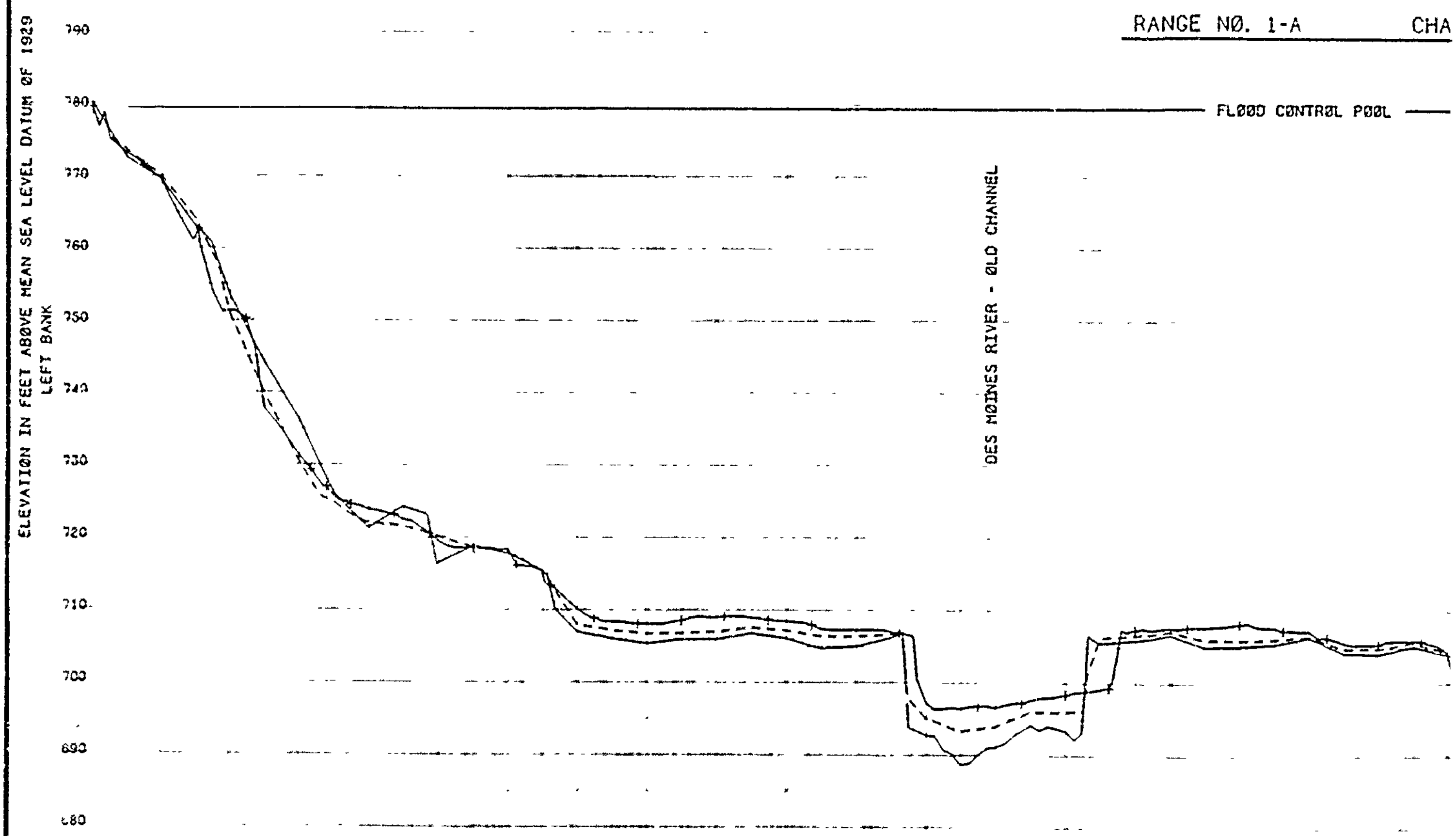
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RESERVOIR THALWEG

PLATE 13



RANGE NØ. 1-A CHA



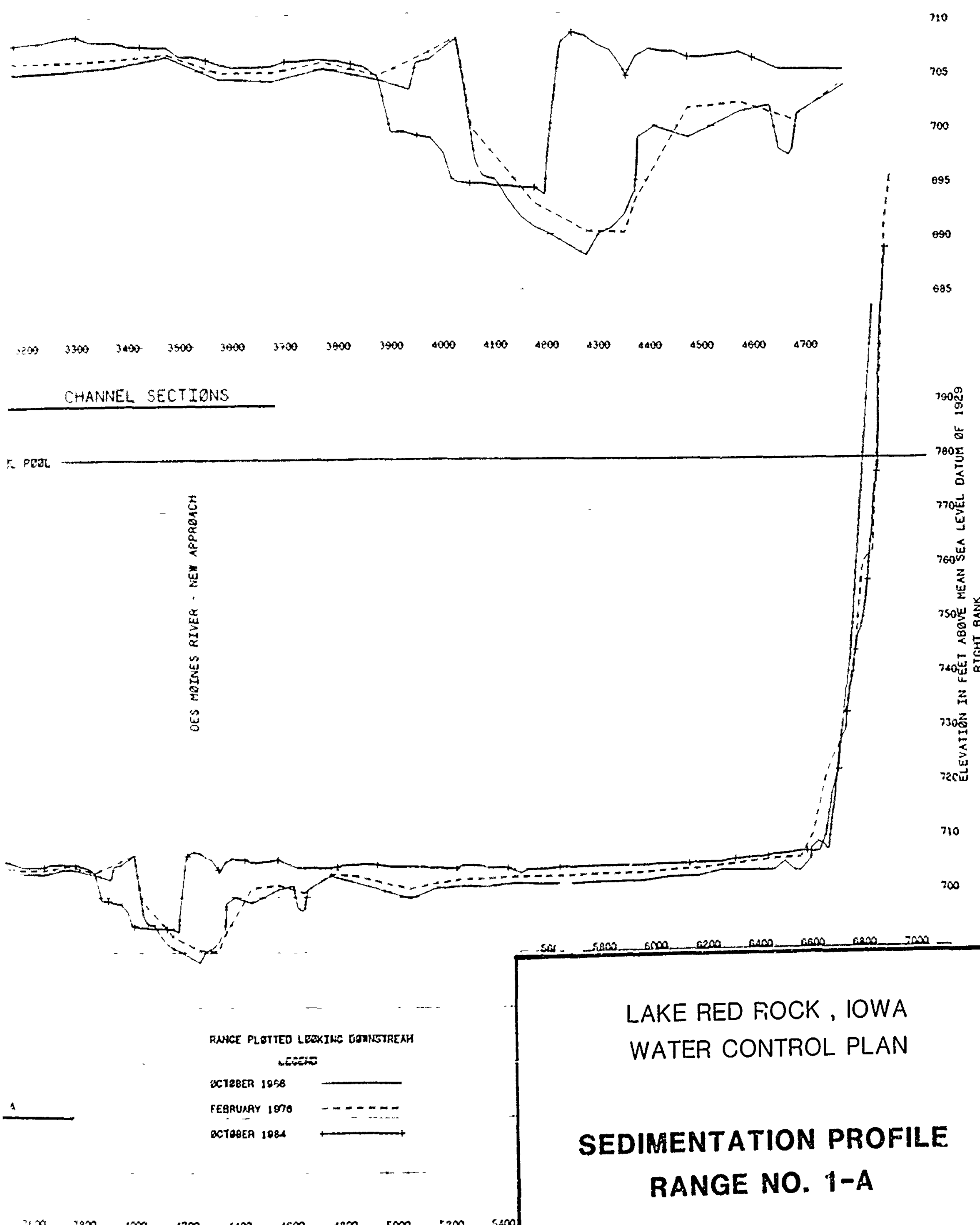
FIELD BØØK REFERENCES
HØRZ. CØNTRØL N-RR-320 PP 2-10
VERT. N-RR-321 P 2
~~ØRIG. PRØFILE N-RR-321 PP 9-10 -274 PP 18-24~~
2ND PRØFILE N-RR-525 PP 2-6
3RD PRØFILE N-RR-559 PP 21-24 -561 PP 6-17

TØPØ SHEET LØCATIØN-
DAM SITE TØPØ.
(RR-PT-G3C.-G3D.-H3A)

RANGE NØ. 1-A
MILE 0.25

0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 3600 3800

DISTANCE IN FEET



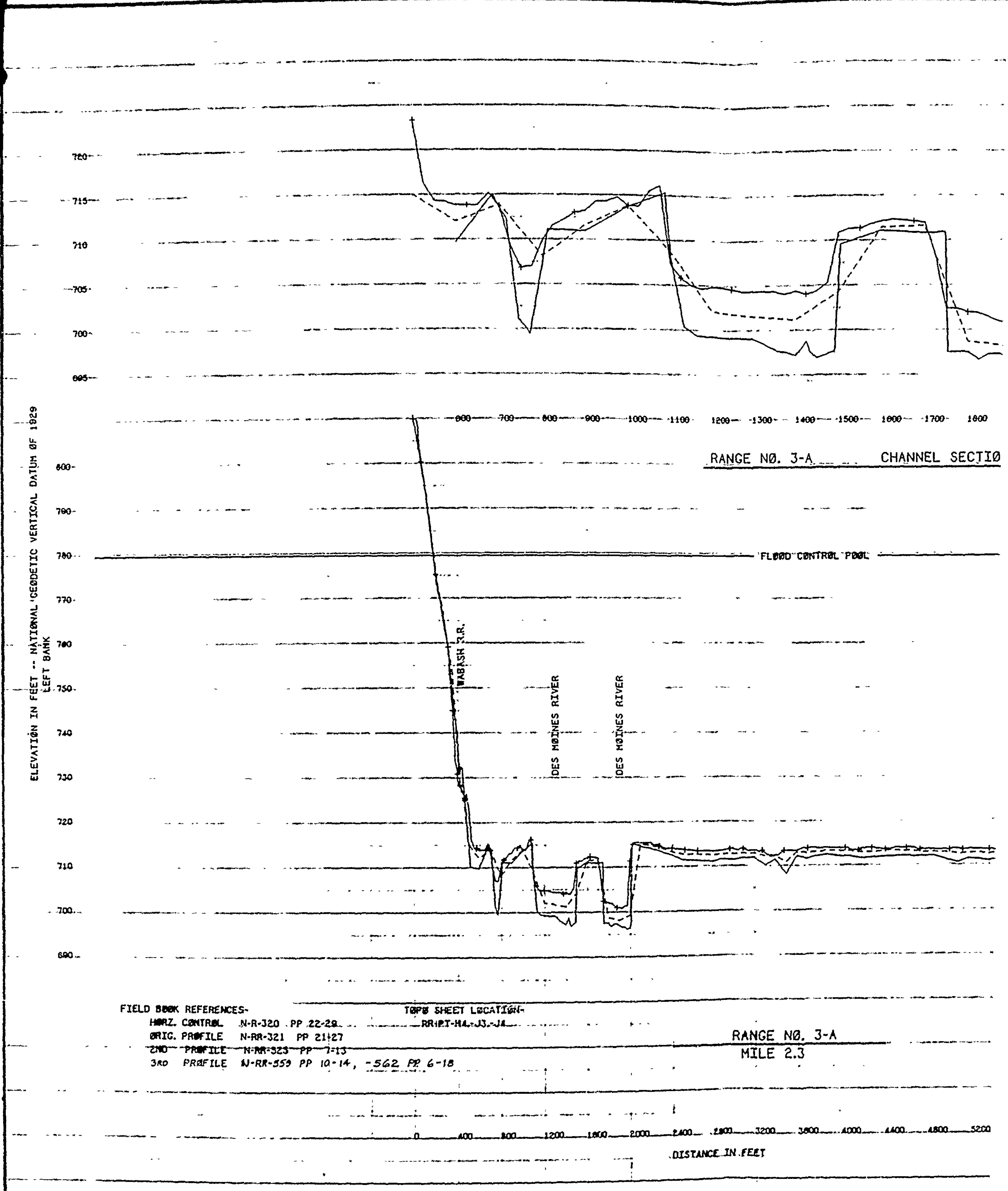
LAKE RED ROCK , IOWA

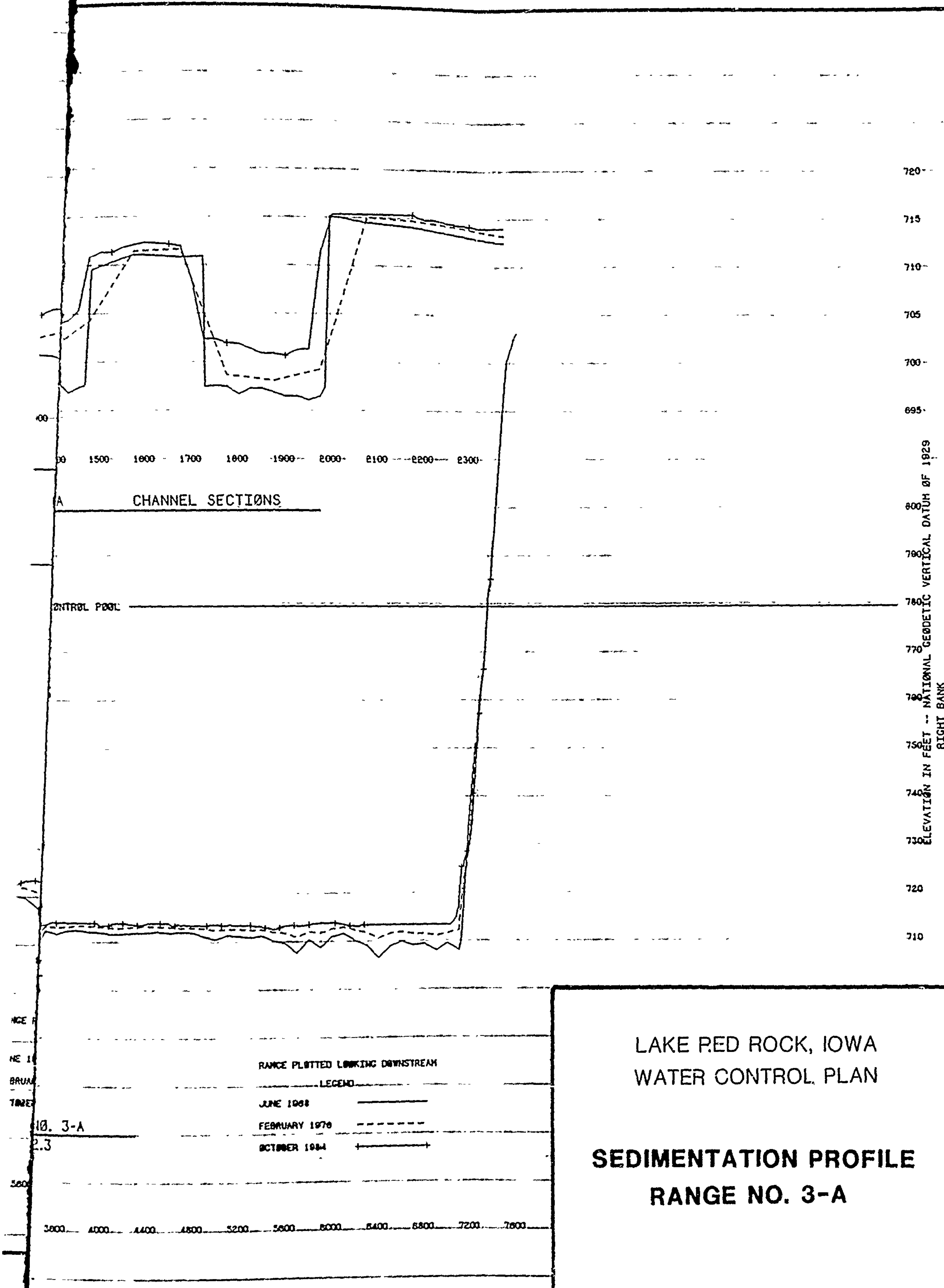
WATER CONTROL PLAN

SEDIMENTATION PROFILE

RANGE NO. 1-A

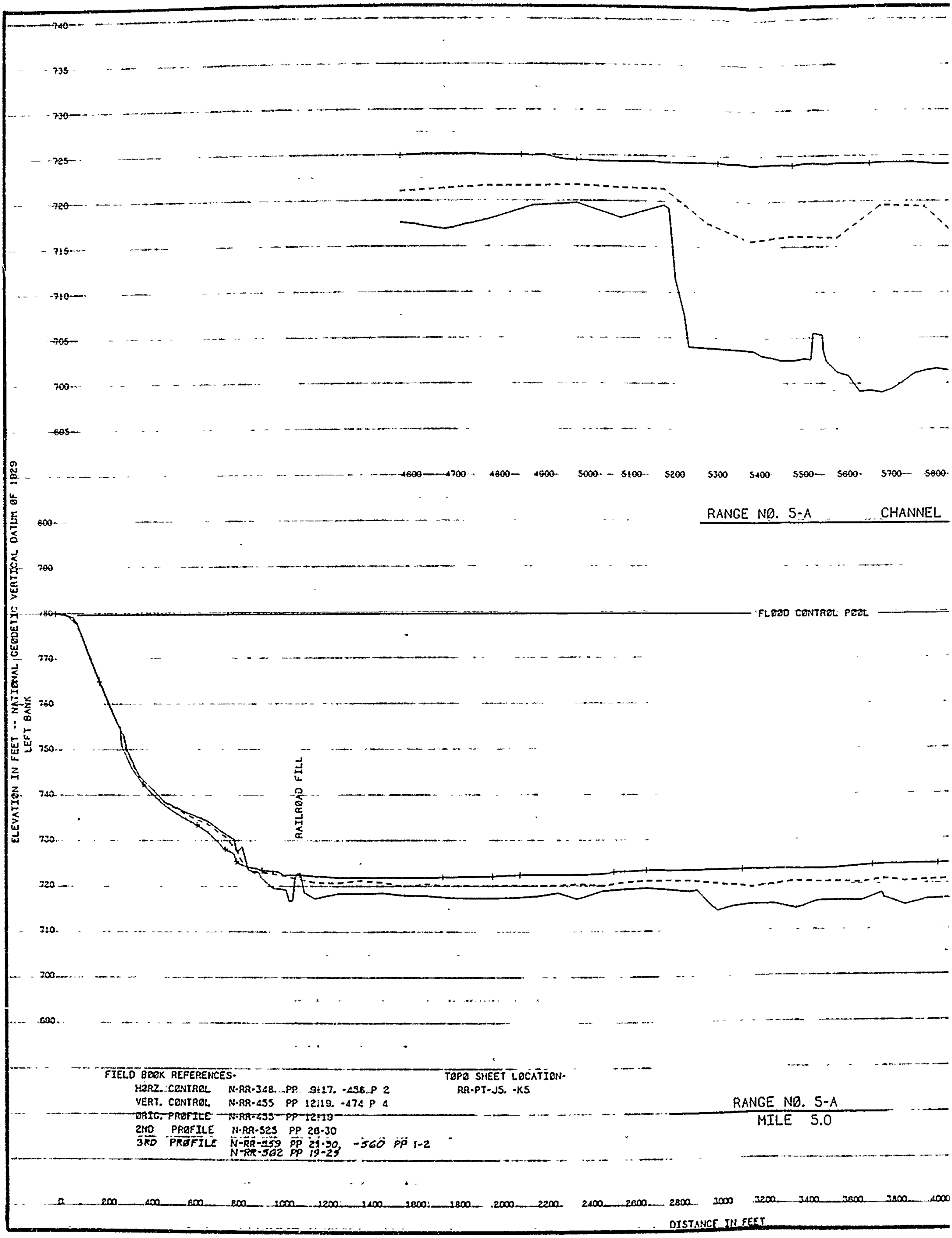
PLATE 14


ELEVATION IN FEET -- NATIONAL GEODETIC VERTICAL DATUM OF 1929
LEFT BANK
720
715
710
705
700
695
600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
RANGE NO. 3-A
CHANNEL SECTIO
800
790
780
FLOOD CONTROL POOL
770
760
750
740
730
720
710
700
690
WABASH R.R.
DES MOINES RIVER
DES MOINES RIVER
FIELD BOOK REFERENCES-
HORZ. CONTROL N-R-320 PP 22-29
ORIG. PROFILE N-RR-321 PP 21-27
2ND PROFILE N-RR-323 PP 7-13
3RD PROFILE N-RR-559 PP 10-14, -562 PP 6-18
TOPO SHEET LOCATION-
RR-PT-H4,-J3,-J4
RANGE NO. 3-A
MILE 2.3
0 400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200
DISTANCE IN FEET

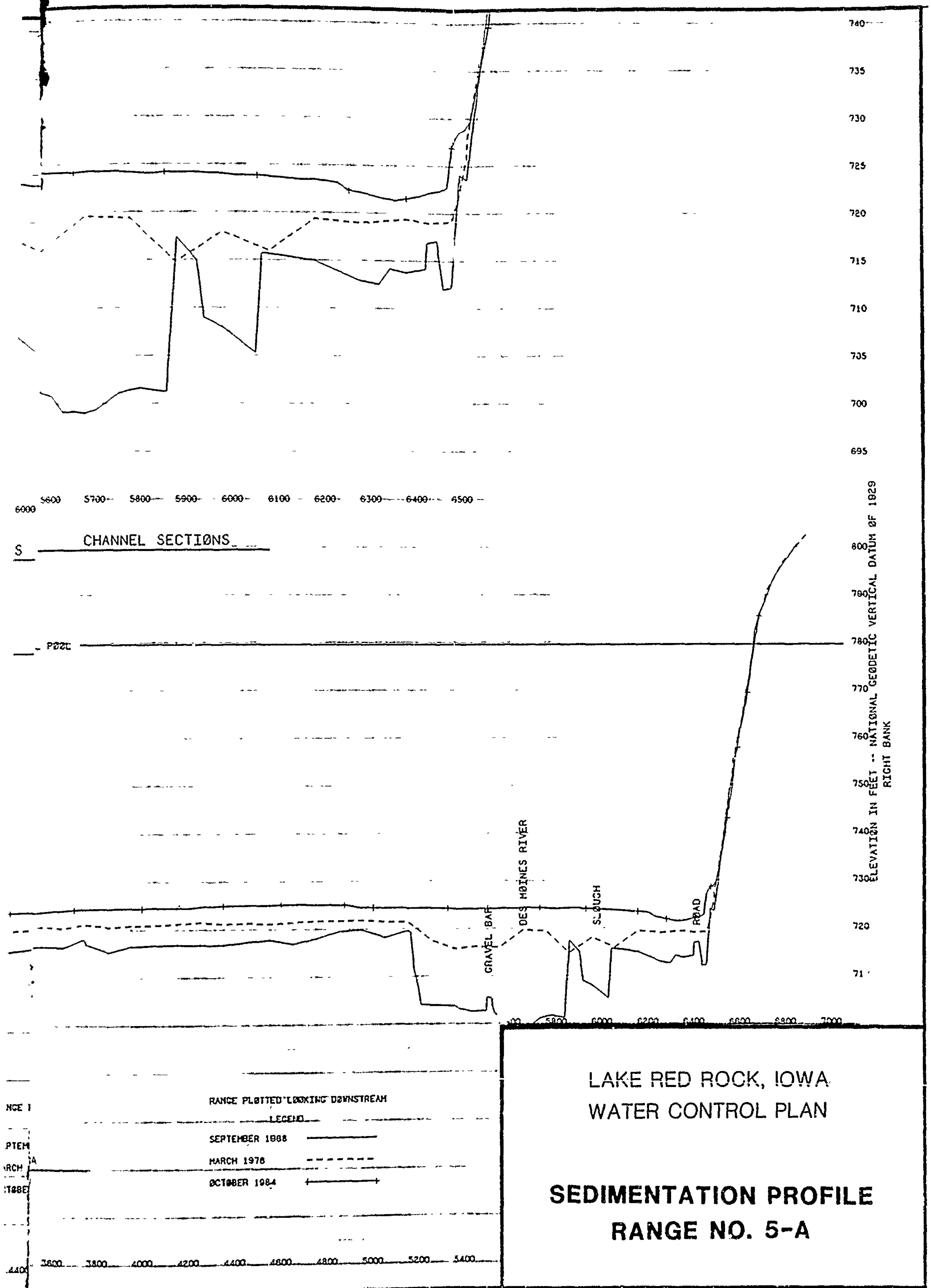


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO. 3-A

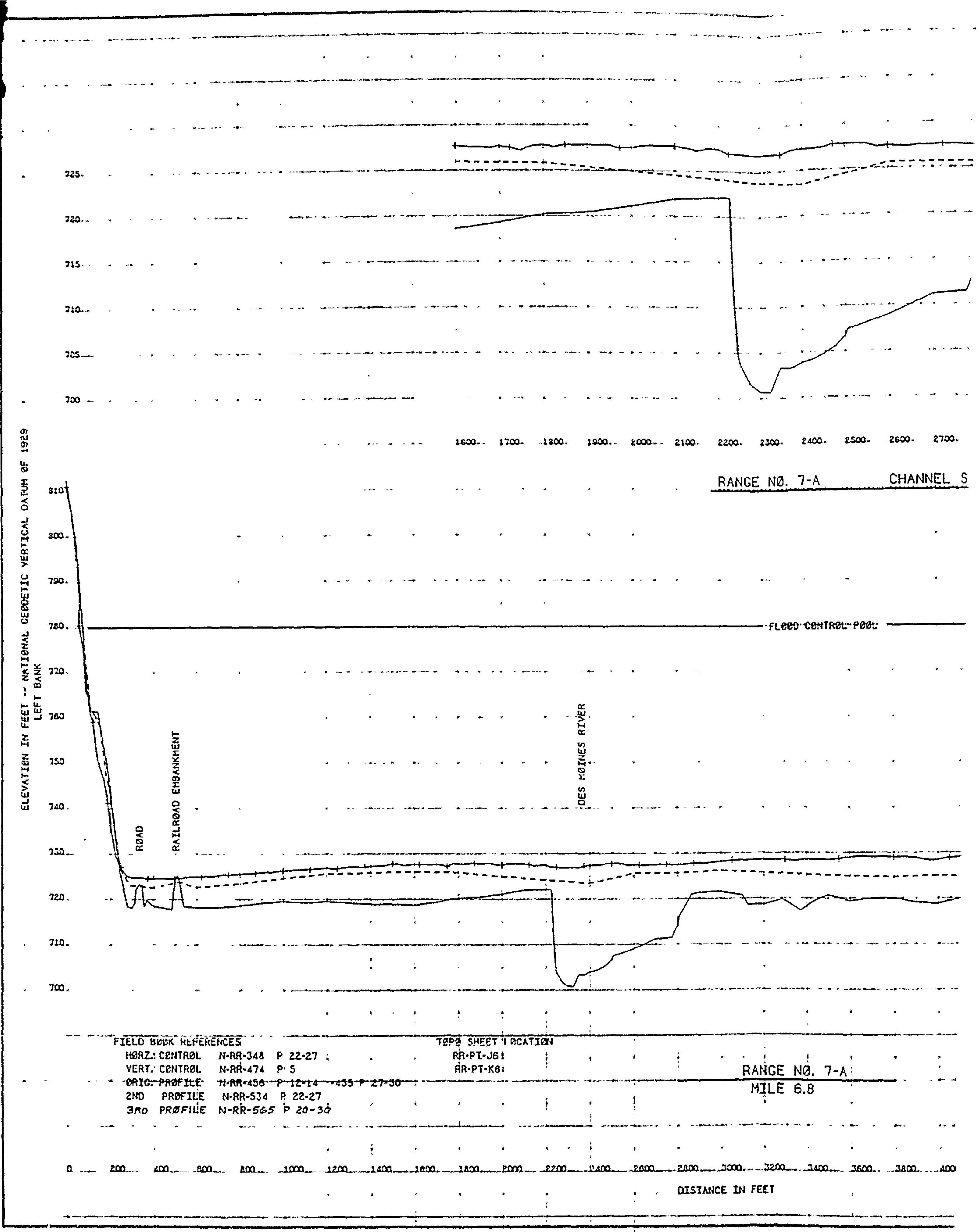


ELEVATION IN FEET -- NATIONAL GEODETIC VERTICAL DATUM OF 1929
RANGE NO. 5-A CHANNEL
LEFT BANK
FLOOD CONTROL POOL
RAILROAD FILL
FIELD BOOK REFERENCES-
HORZ. CONTROL N-RR-348 PP 9-17, -456 P 2
VERT. CONTROL N-RR-455 PP 12-19, -474 P 4
ORIG. PROFILE N-RR-455 PP 12-19
2ND PROFILE N-RR-525 PP 28-30
3RD PROFILE N-RR-559 PP 21-30, -560 PP 1-2
N-RR-502 PP 19-25
TOPO SHEET LOCATION-
RR-PT-J5, -K5
RANGE NO. 5-A
MILE 5.0
DISTANCE IN FEET

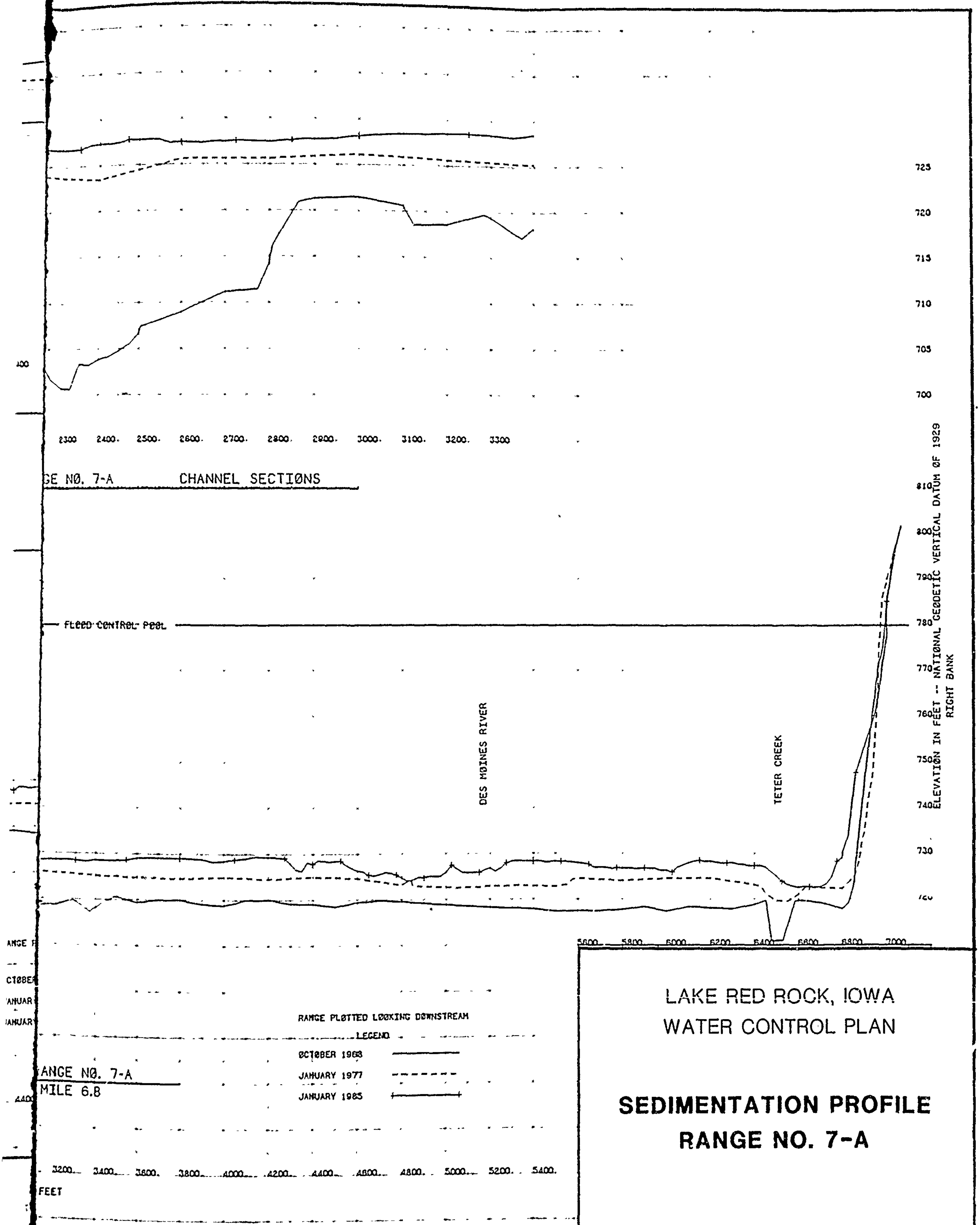


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO. 5-A



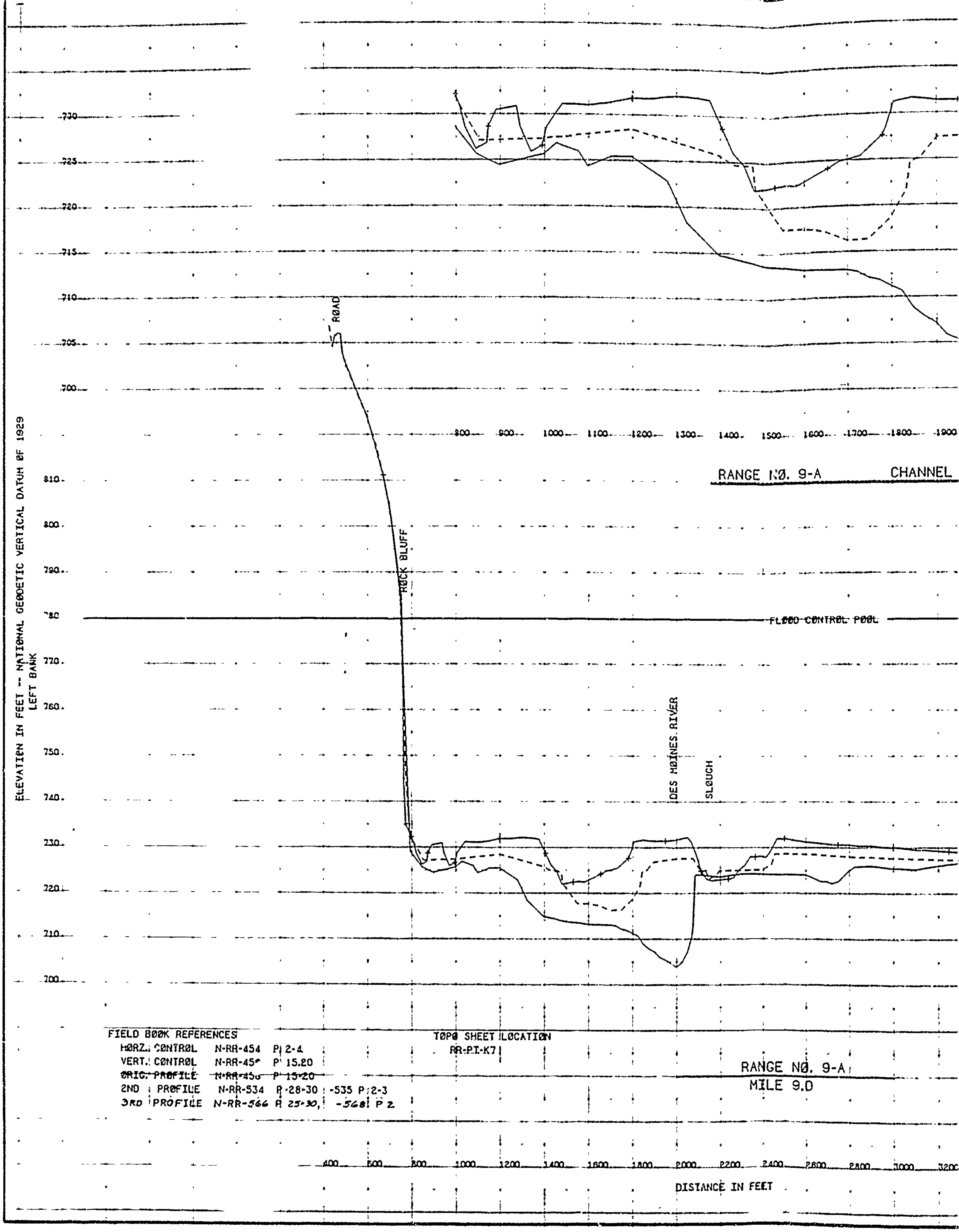
RANGE NØ. 7-A CHANNEL S
ELEVATION IN FEET -- NATIONAL GEØDETIC VERTICAL DATUM ØF 1929
LEFT BANK
FLØØD CØNTRØL PØØL
RØAD
RAILRØAD EMBANKMENT
DES MØINES RIVER
FIELD BØØK REFERENCES
HØRZ. CØNTRØL N-RR-348 P 22-27
VERT. CØNTRØL N-RR-474 P 5
ØRIG. PRØFILE N-RR-456 P 12-14 455 P 27-30
2ND PRØFILE N-RR-534 P 22-27
3RD PRØFILE N-RR-565 P 20-30
TØPØ SHEET LØCATIØN
RR-PT-J61
RR-PT-K61
RANGE NØ. 7-A
MILE 6.8
DISTANCE IN FEET



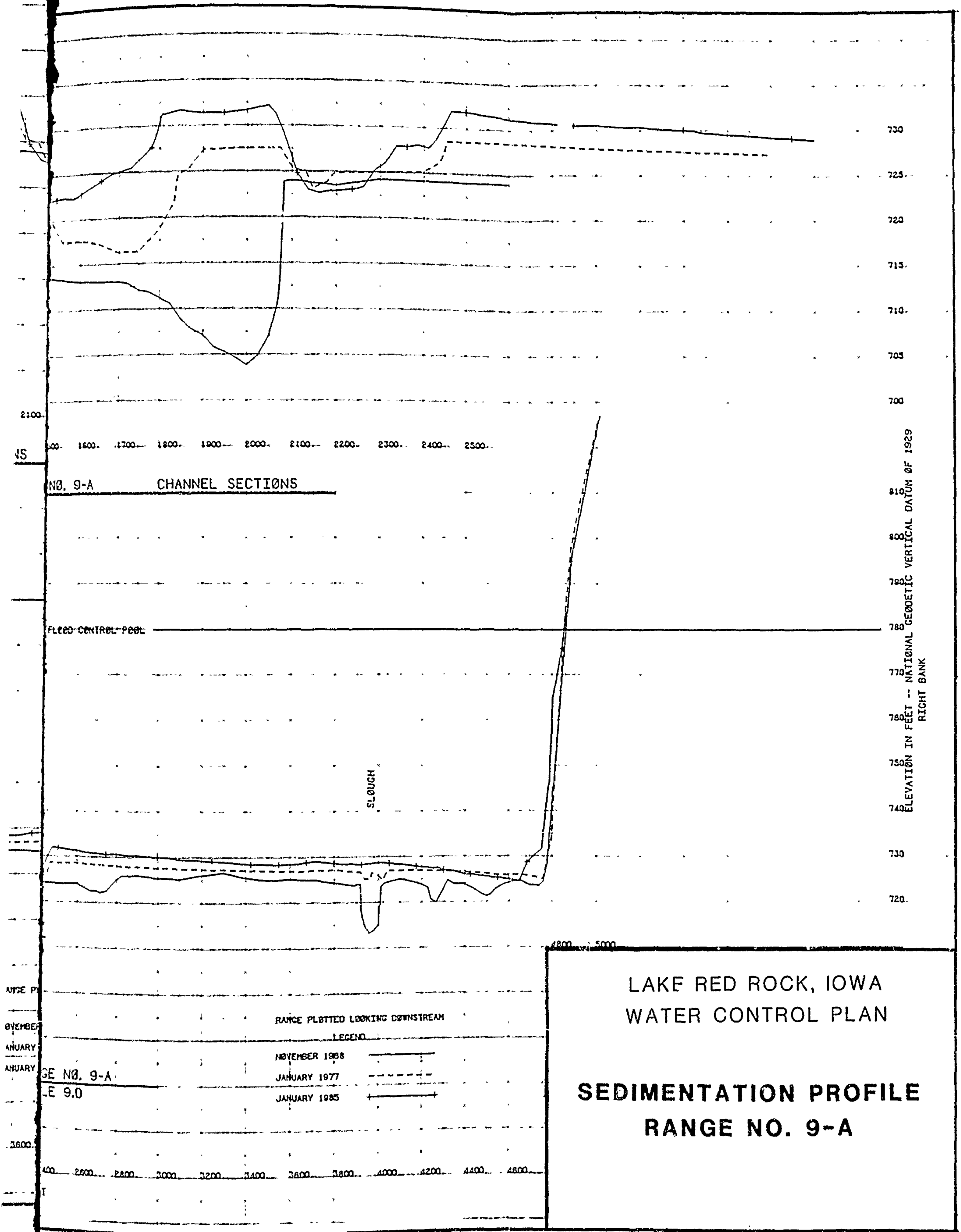
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO. 7-A

PLATE 17



RANGE NØ. 9-A CHANNEL
ROAD
ROCK BLUFF
FLØØD CONTRØL PØØL
DES MØINES RIVER
SLØUGH
ELEVATIØN IN FEET -- NATIØNAL GEØDETIC VERTICAL DATUM ØF 1929
LEFT BANK
FIELD BØØK REFERENCES
HØRZ. CØNTRØL N-RR-454 P 2-4
VERT. CØNTRØL N-RR-45* P 15.20
ØRIG. PRØFILE N-RR-45_ P 15-20
2ND PRØFILE N-RR-534 P 28-30 -535 P 2-3
3RD PRØFILE N-RR-566 P 25-30, -568 P 2
TØPØ SHEET LØCATIØN
RR-PI-K7
RANGE NØ. 9-A
MILE 9.0
DISTANCE IN FEET

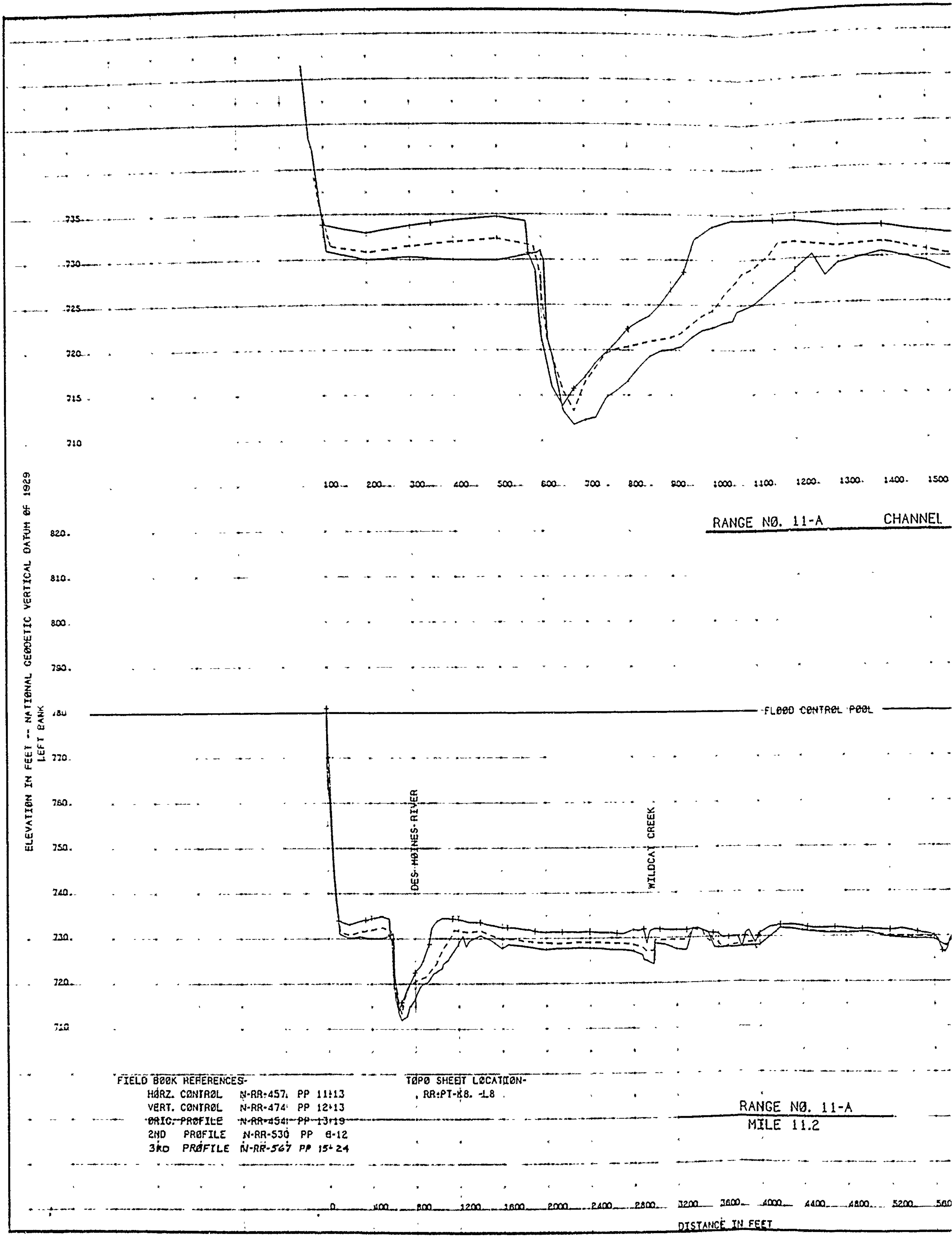


LAKE RED ROCK, IOWA

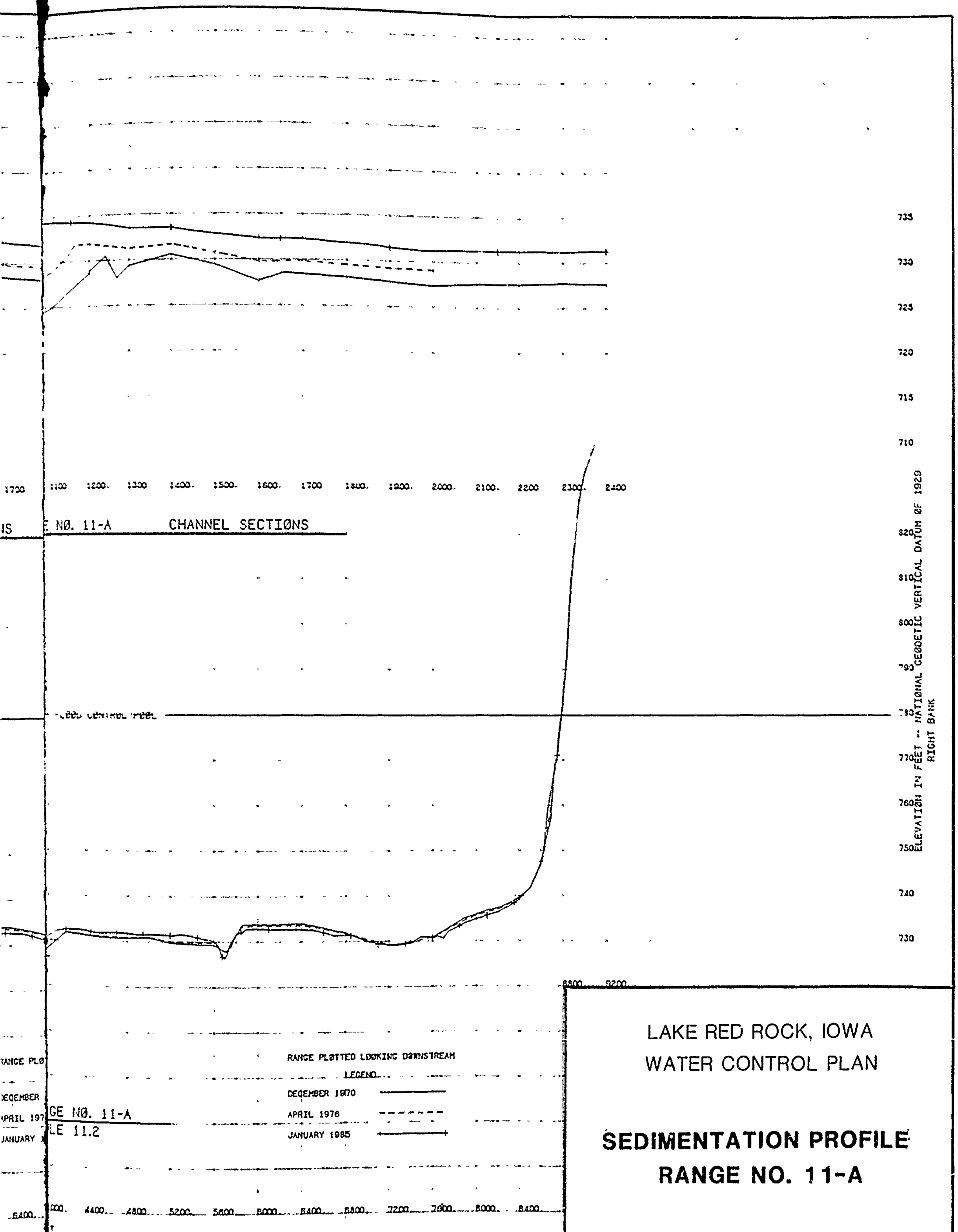
WATER CONTROL PLAN

SEDIMENTATION PROFILE

RANGE NO. 9-A

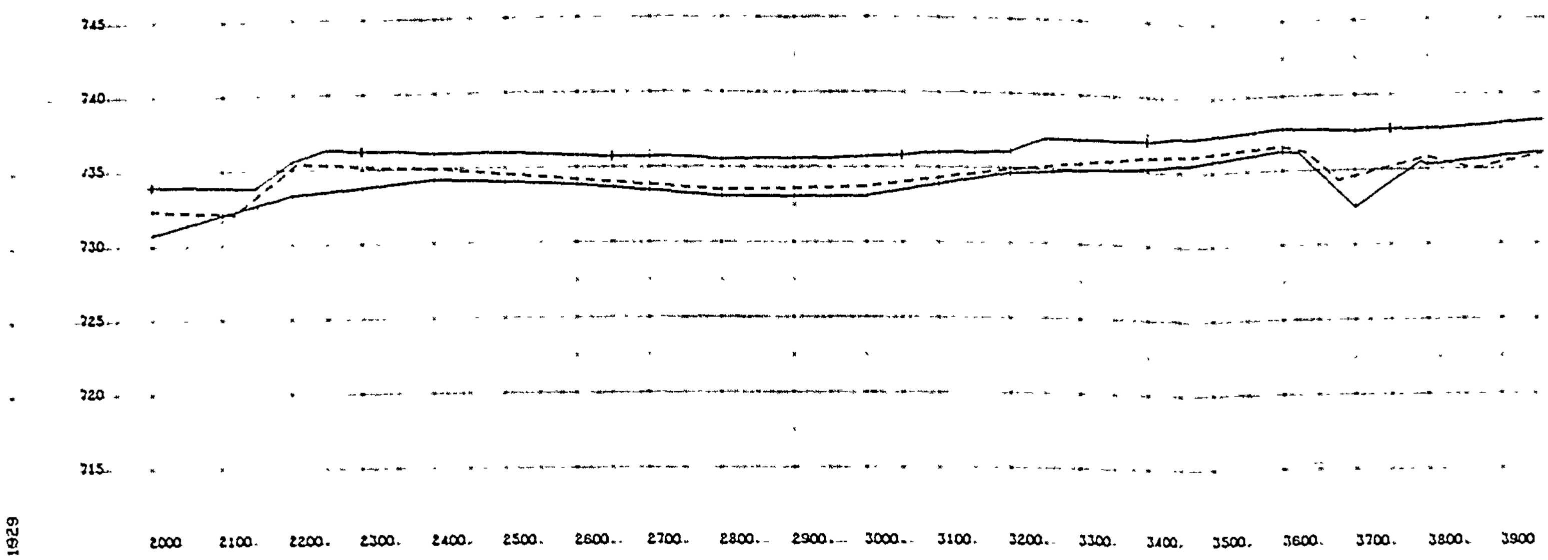


ELEVATION IN FEET -- NATIONAL GEODETIC VERTICAL DATUM OF 1929
LEFT BANK
735
730
725
720
715
710
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
RANGE NØ. 11-A CHANNEL
820
810
800
790
780
770
760
750
740
730
720
710
FLØØD CØNTRØL PØØL
DES MØINES RIVER
WILDCAT CREEK
FIELD BØØK REFERENCES-
HØRZ. CØNTRØL N-RR-457 PP 11-13
VERT. CØNTRØL N-RR-474 PP 12-13
ØRIG. PRØFILE N-RR-454 PP 13-19
2ND PRØFILE N-RR-530 PP 6-12
3RD PRØFILE N-RR-567 PP 15-24
TØPØ SHEET LØCATIØN-
RR-PT-K8, L8
RANGE NØ. 11-A
MILE 11.2
0 400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200 5600
DISTANCE IN FEET

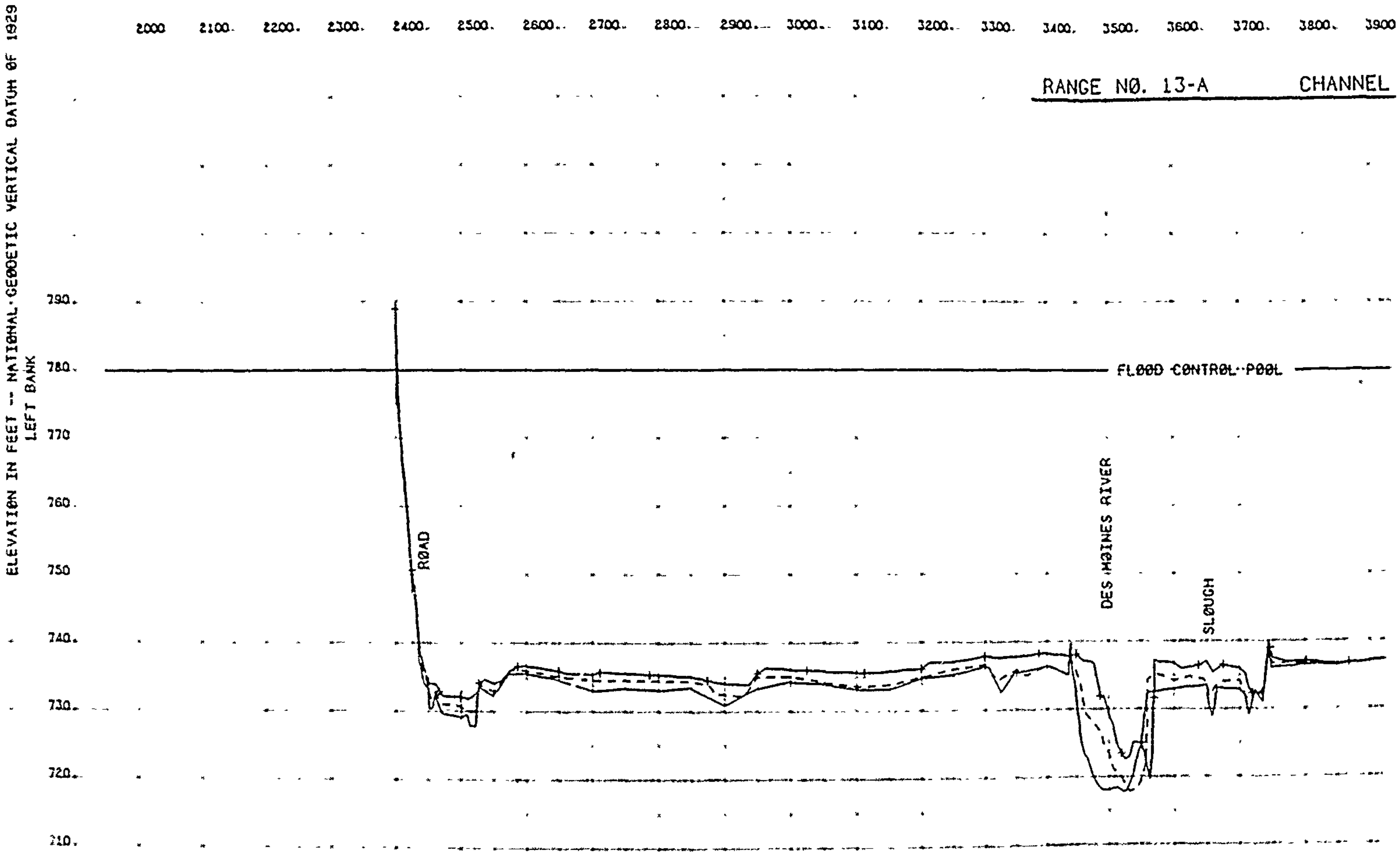


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO. 11-A



RANGE NØ. 13-A CHANNEL



FIELD BØØK REFERENCES

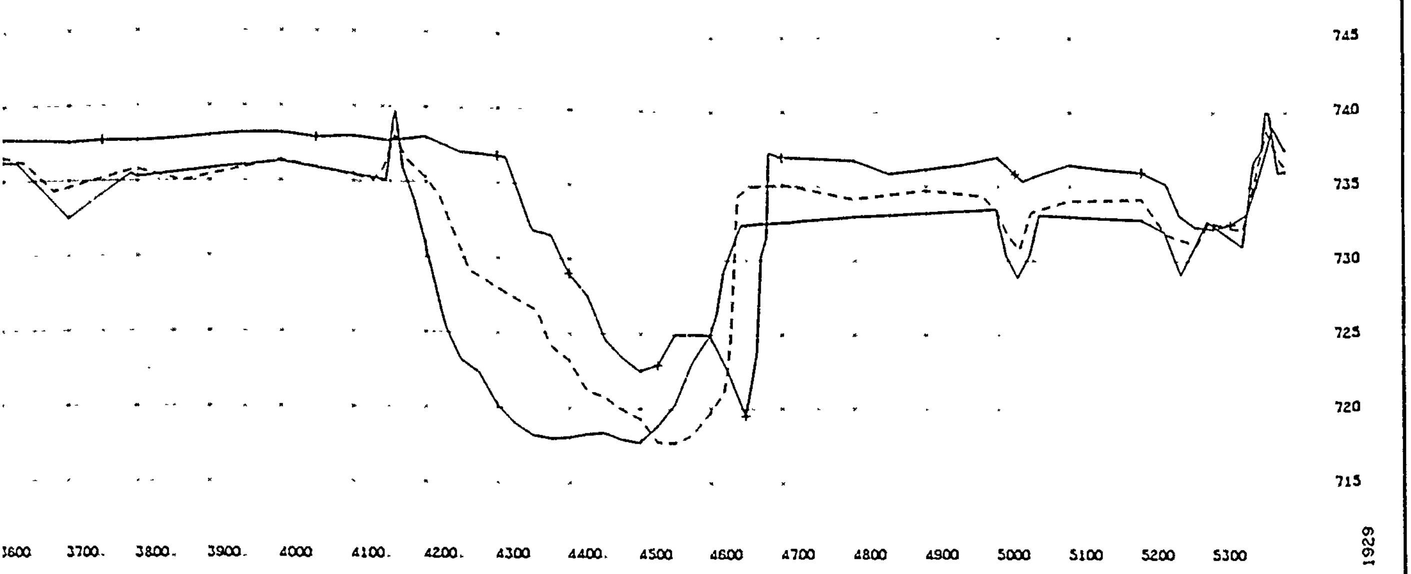
HØRZ. CØNTRØL	N-RR-485 PP 8-10	
VERT. CØNTRØL	N-RR-482, P 26;	-488 P 3
~~ØRIG. PRØFILE~~	~~N-RR-482, PP 28-30; -488 P 2-3~~	
2ND PRØFILE	N-RR-533 PP 19-25	
3RD PRØFILE	N-RR-567 PP 25-30, -569 P 27	

TØPØ SHEET LØCATIØN
RR-PT-K9, -L9.

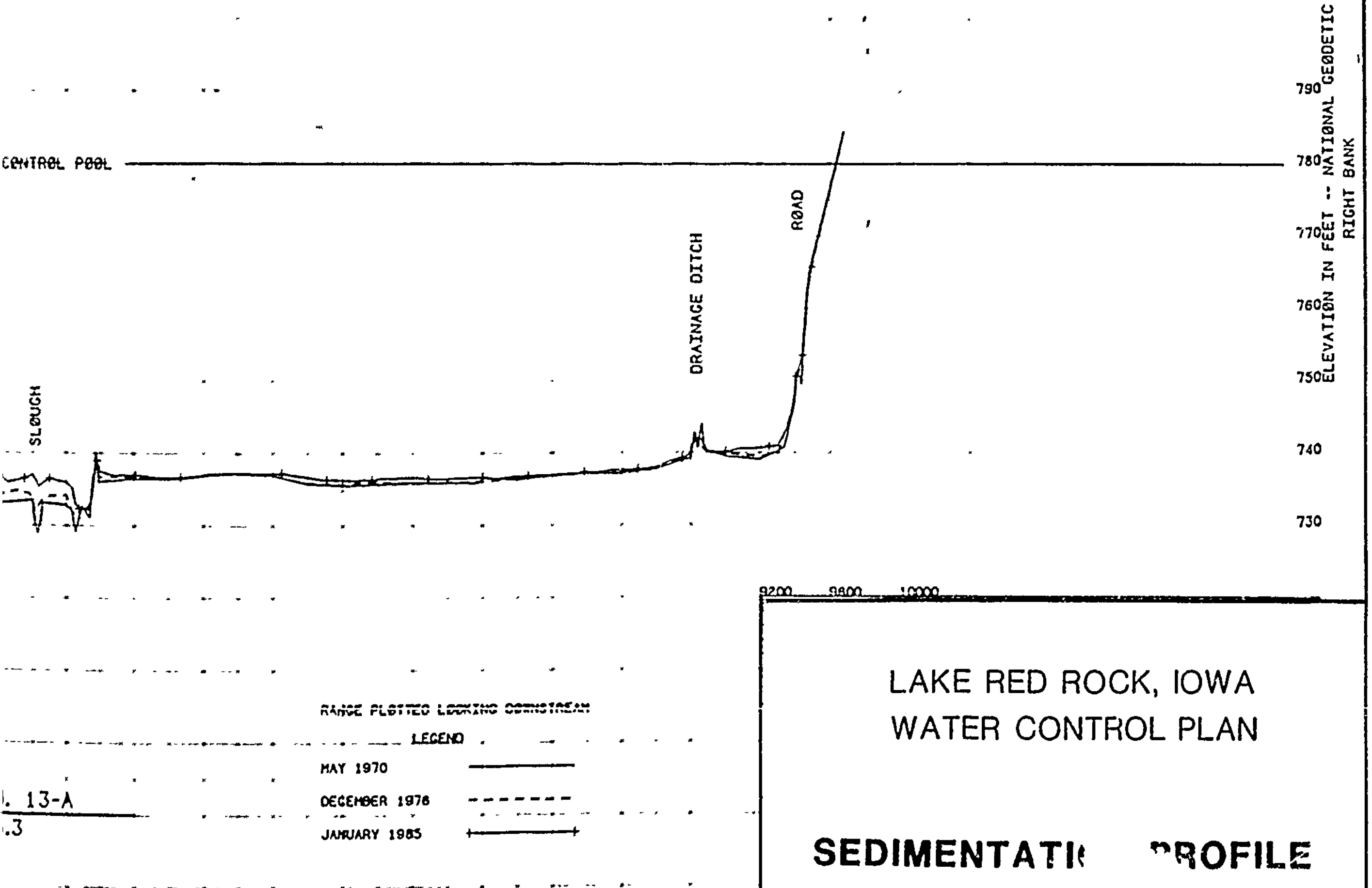
RANGE NØ. 13-A
MILE 13.3

0 400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800 5200 5600

DISTANCE IN FEET



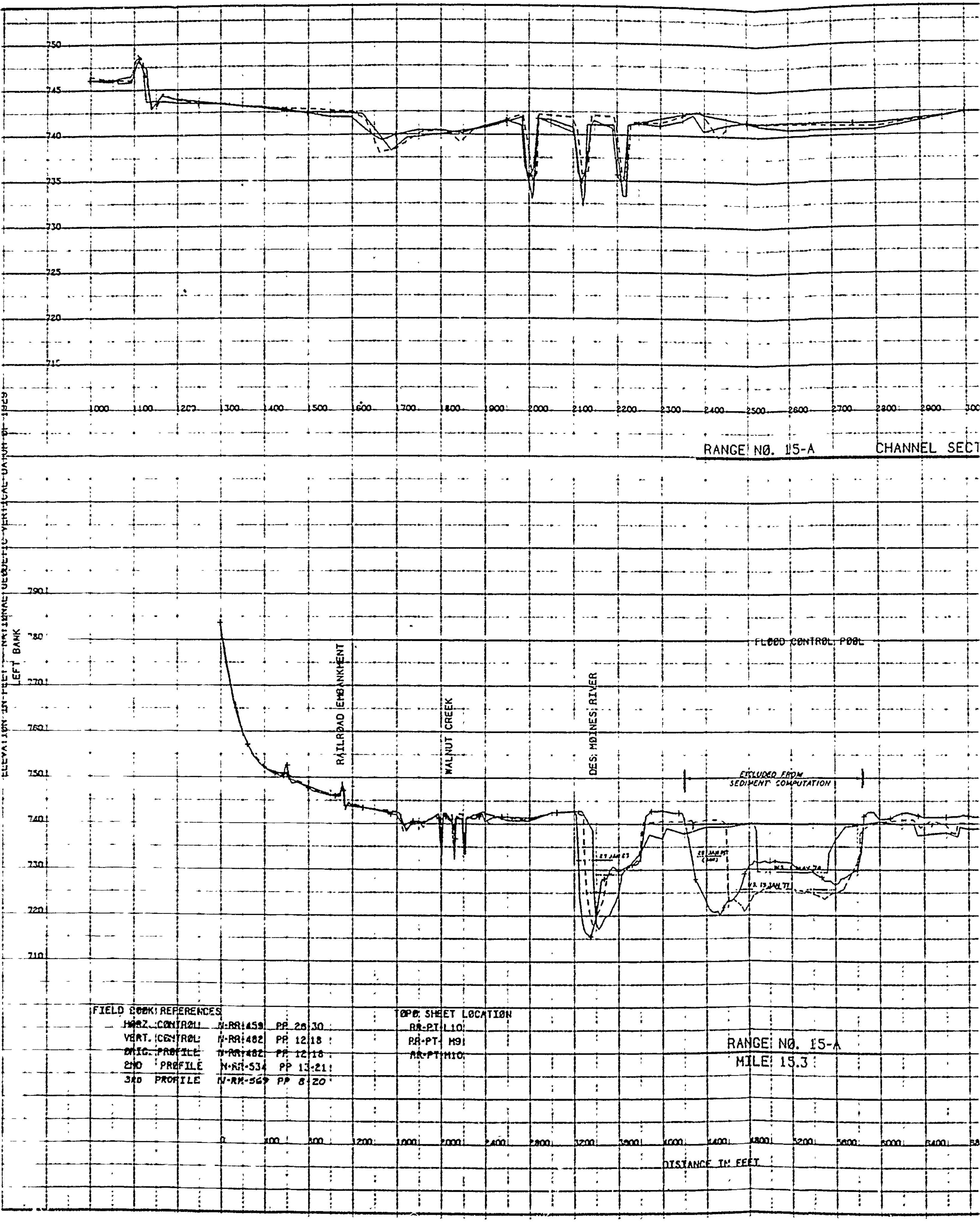
3-A CHANNEL SECTIØNS



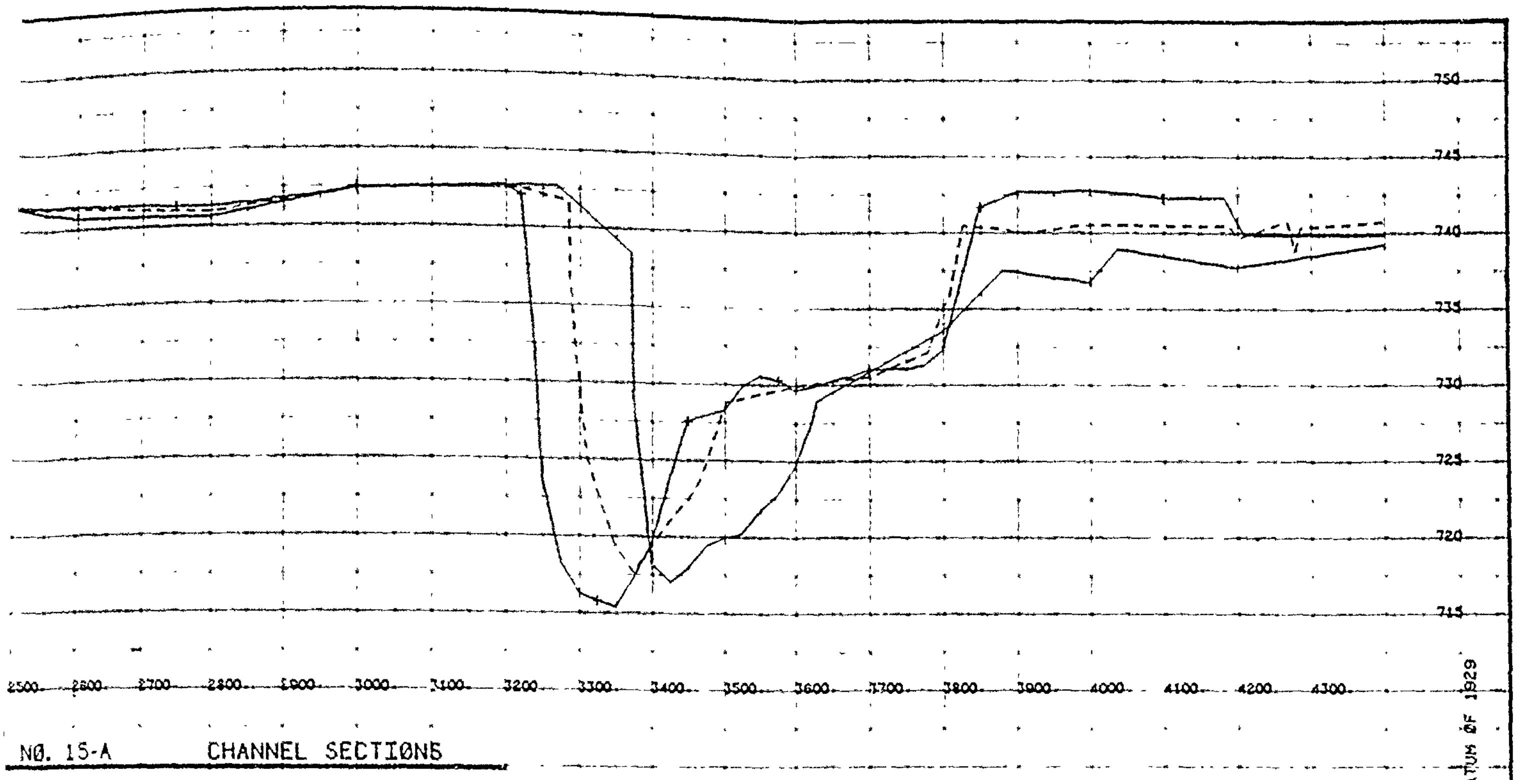
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

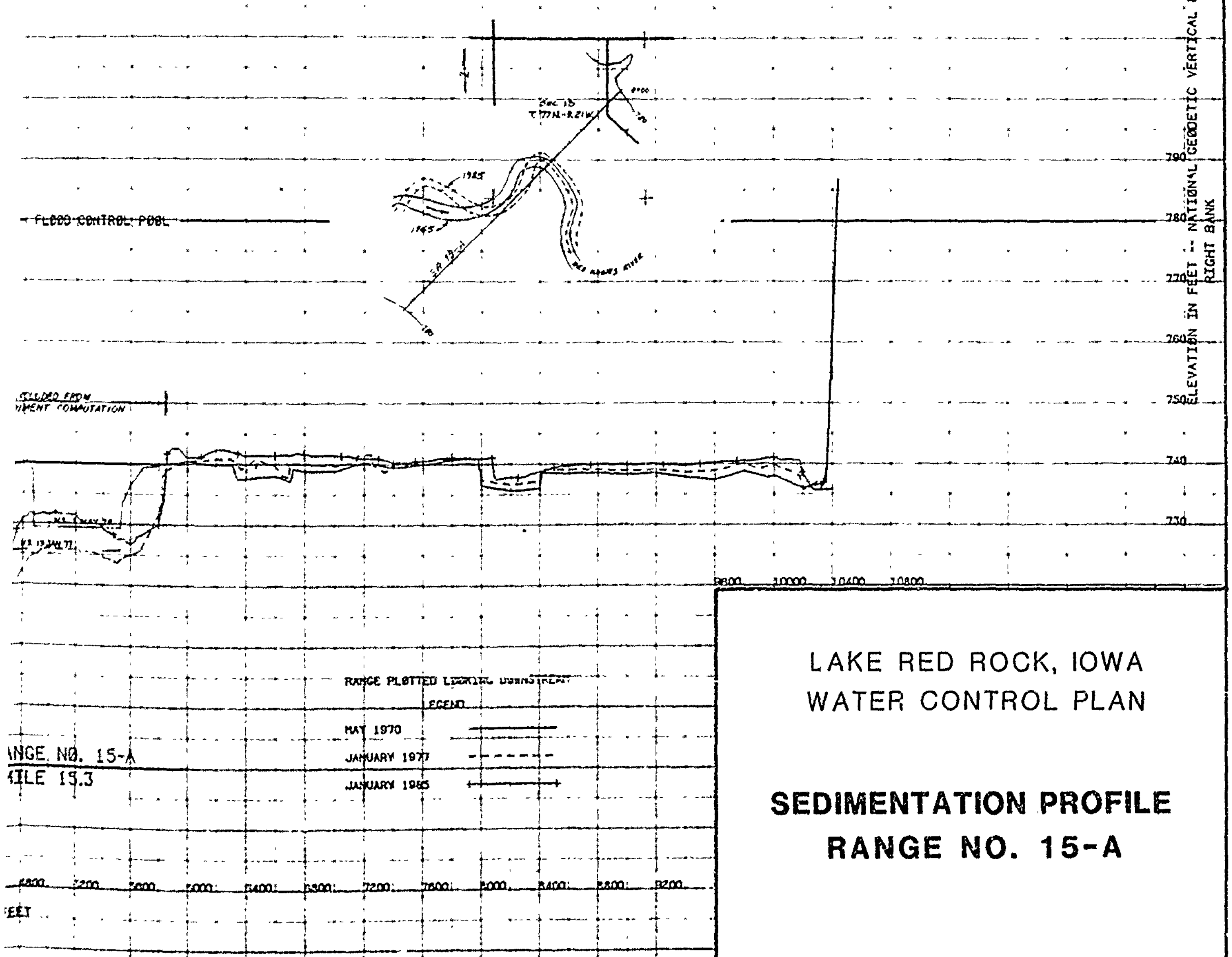
SEDIMENTATI PROFILE
RANGE N A

PLATE 20



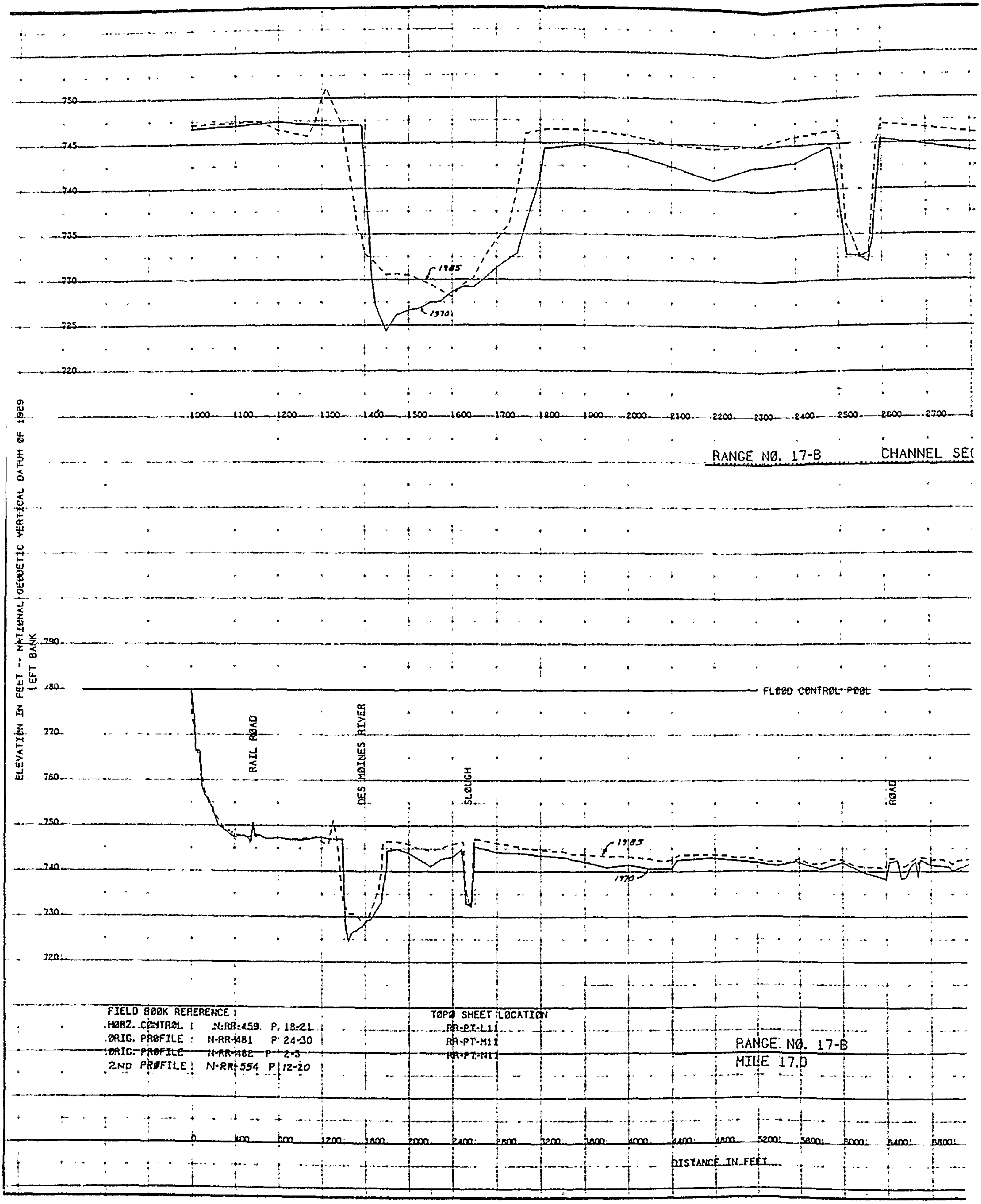
750
745
740
735
730
725
720
715
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
RANGE NØ. 15-A
CHANNEL SECT
ELEVATION IN FEET — NATIONAL GEODETIC VERTICAL DATUM OF 1929
LEFT BANK
790
780
770
760
750
740
730
720
710
FLØØD CØNTRØL PØØL
RAILRØAD EMBANKMENT
WALNUT CREEK
DES MØINES RIVER
EXCLUDED FROM SEDIMENT COMPUTATION
FIELD BØØK REFERENCES
HØRZ. CØNTRØL N-RR 459 PP 28 30
VERT. CØNTRØL N-RR 482 PP 12 18
ØRIG. PRØFILE N-RR 482 PP 12 18
2ND PRØFILE N-RR-534 PP 13-21
3RD PRØFILE N-RR-569 PP 8 20
TØPØ SHEET LØCATIØN
RR-PT L10
RR-PT M9
RR-PT M10
RANGE NØ. 15-A
MILE 15.3
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
4400
4800
5200
5600
6000
6400
DISTANCE IN FEET



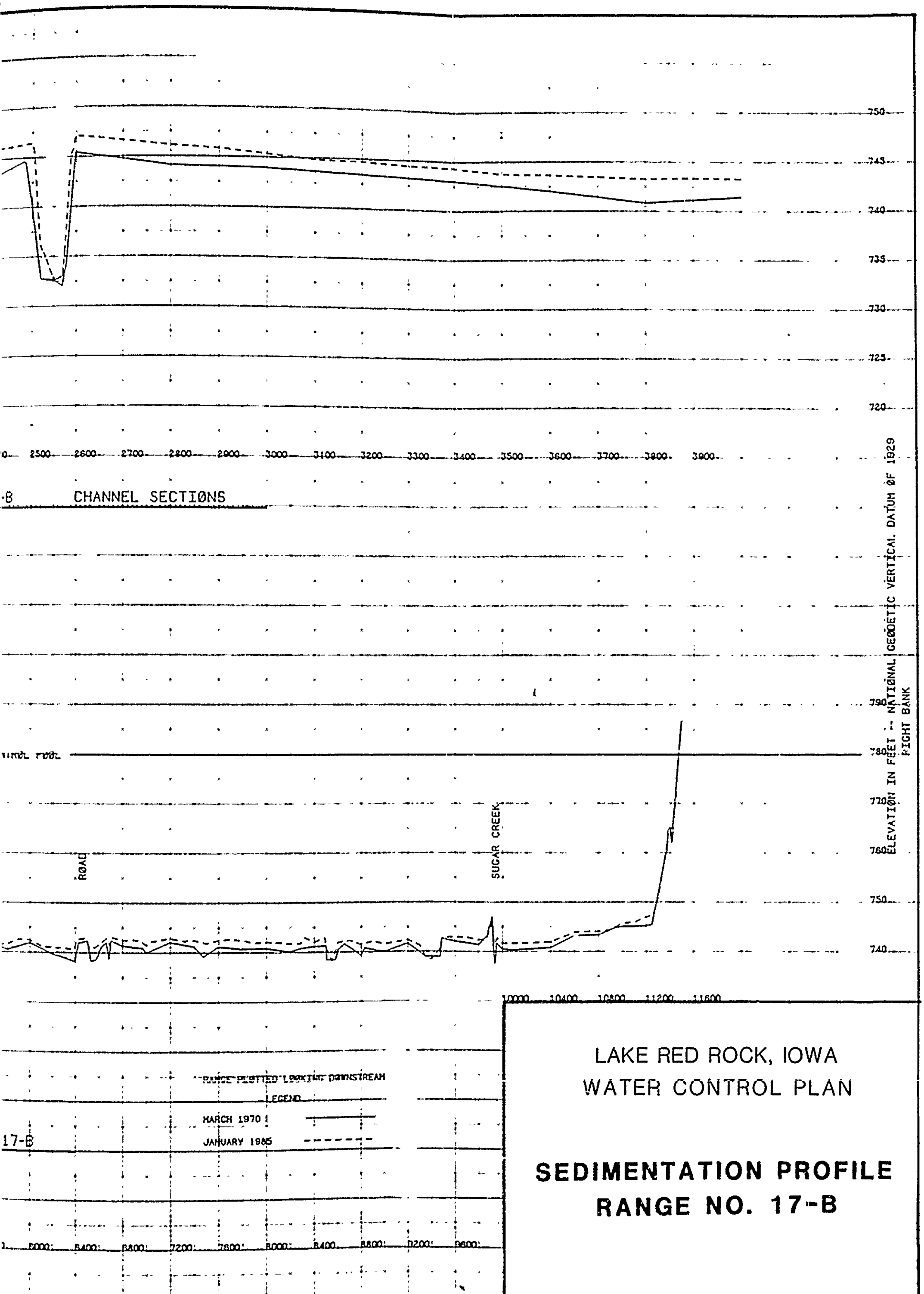


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO. 15-A



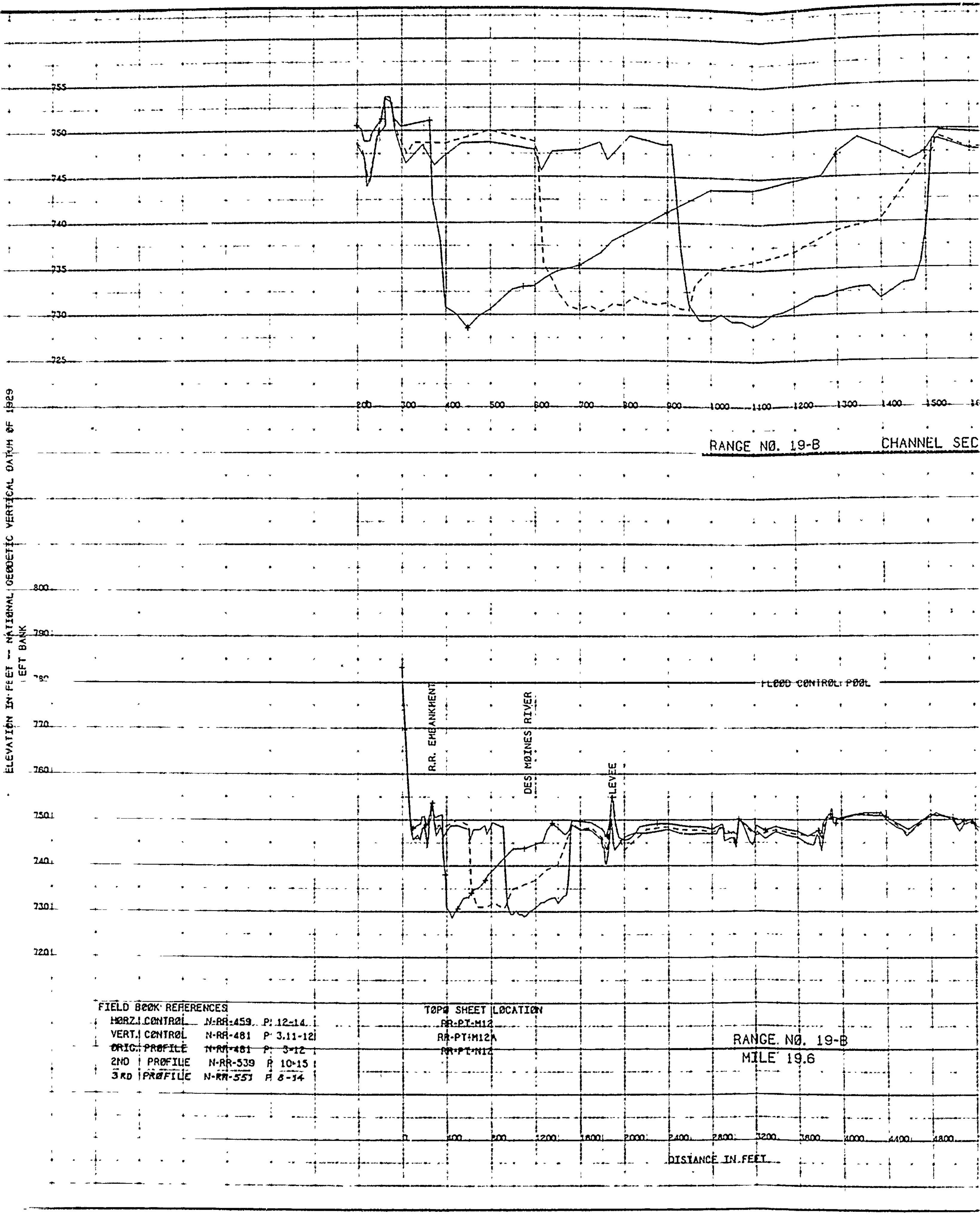
750
745
740
735
730
725
720
1985
1970
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
RANGE NØ. 17-B
CHANNEL SE
ELEVATIØN IN FEET -- NATIØNAL GEØDETIC VERTICAL DATUM ØF 1929
LEFT BANK
790
780
770
760
750
740
730
720
FLØØD CØNTRØL PØØL
RAIL RØAD
DES MØINES RIVER
SLØUGH
RØAD
1985
1970
FIELD BØØK REFERENCE :
HØRZ. CØNTRØL : N-RR-459 P. 18-21
ØRIG. PRØFILE : N-RR-481 P. 24-30
ØRIG. PRØFILE N-RR-482 P. 2-3
2ND PRØFILE : N-RR-554 P. 12-20
TØPØ SHEET LØCATIØN
RR-PT-L11
RR-PT-M11
RR-PT-N11
RANGE NØ. 17-B
MILE 17.0
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
4400
4800
5200
5600
6000
6400
6800
DISTANCE IN FEET



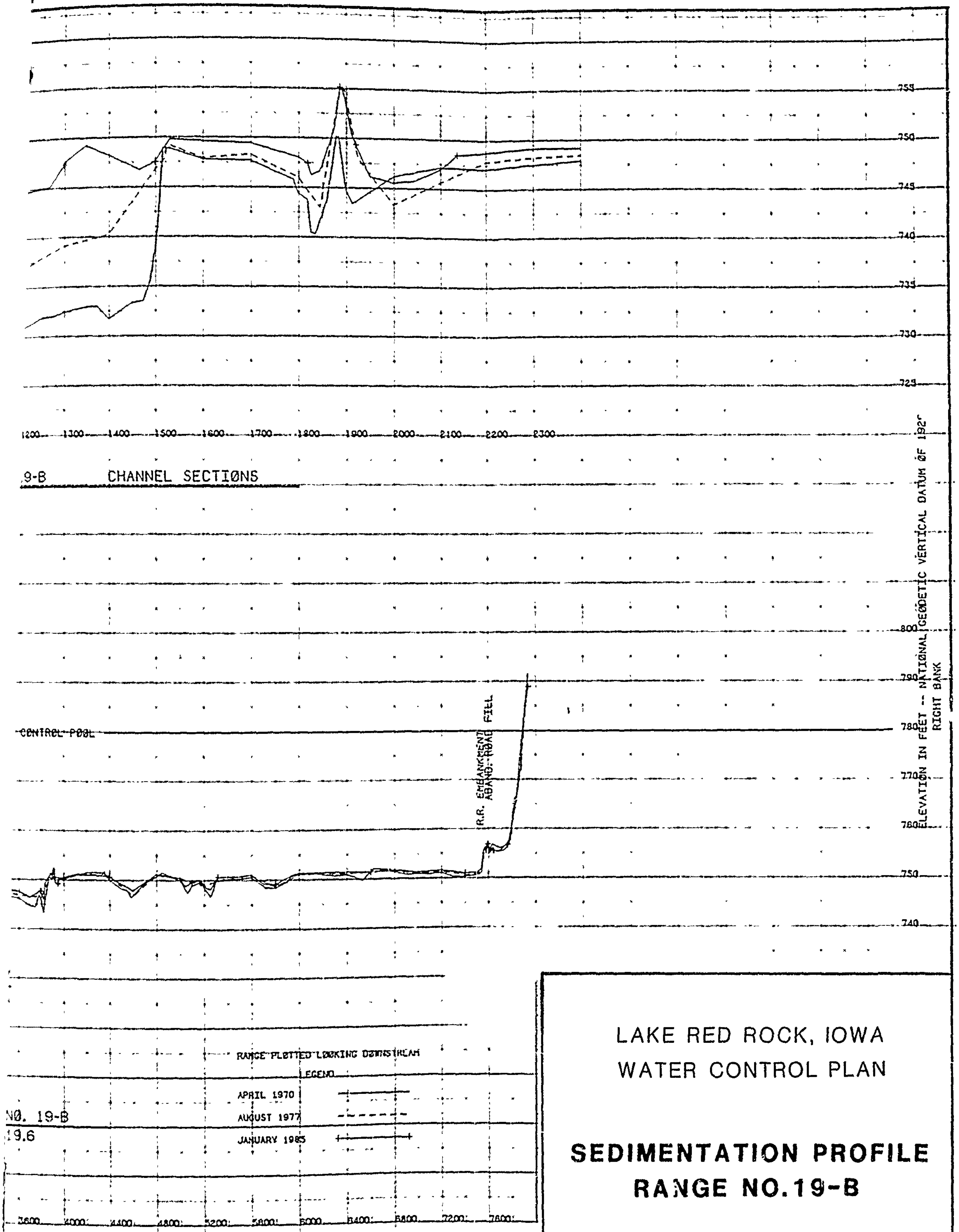
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO. 17-B

PLATE 22

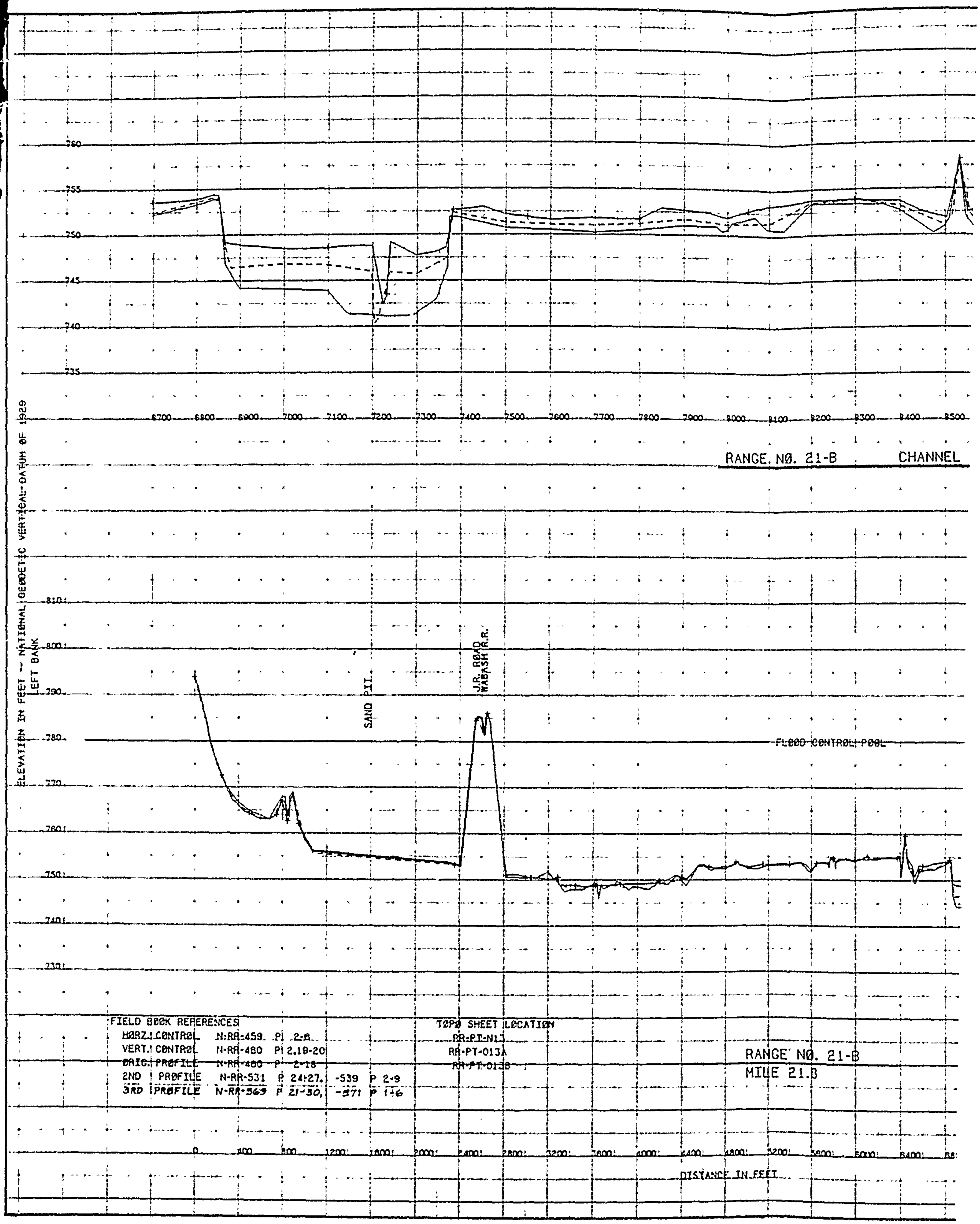


ELEVATION IN FEET -- NATIONAL GEODETIC VERTICAL DATUM OF 1929
LEFT BANK
755
750
745
740
735
730
725
200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
RANGE NØ. 19-B
CHANNEL SEC
800
790
780
770
760
750
740
730
720
FLOOD CONTROL POOL
R.R. EMBANKMENT
DES MØINES RIVER
LEVEE
FIELD BØØK REFERENCES
HØRZ. CONTRØL N-RR-459 P. 12-14
VERT. CØNTRØL N-RR-481 P. 3,11-12
ØRIG. PRØFILE N-RR-481 P. 3-12
2ND PRØFILE N-RR-539 P. 10-15
3RD PRØFILE N-RR-551 P. 8-14
TØPØ SHEET LØCATIØN
RR-PT-M12
RR-PT-M12A
RR-PT-N12
RANGE NØ. 19-B
MILE 19.6
0 400 800 1200 1600 2000 2400 2800 3200 3600 4000 4400 4800
DISTANCE IN FEET

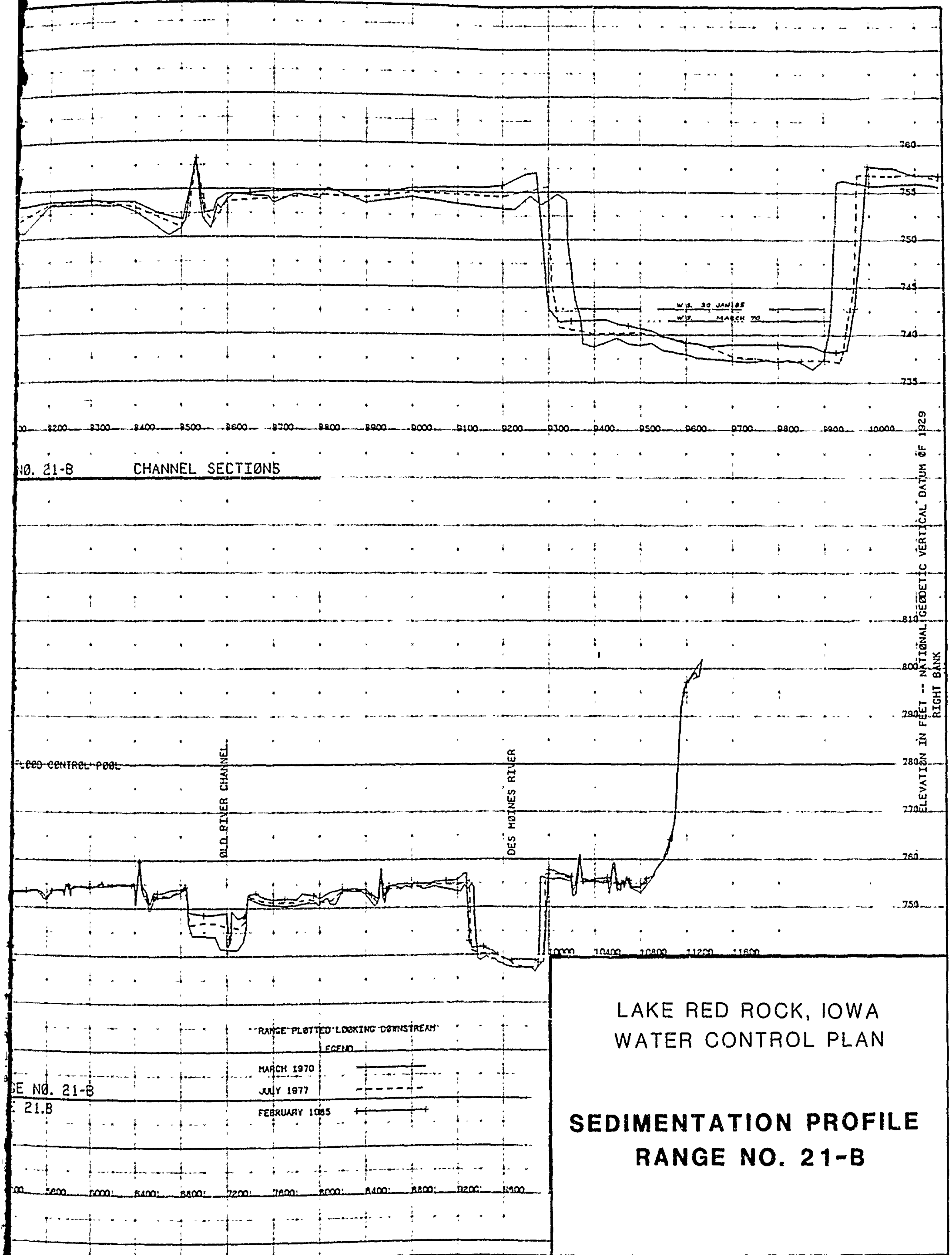


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO.19-B

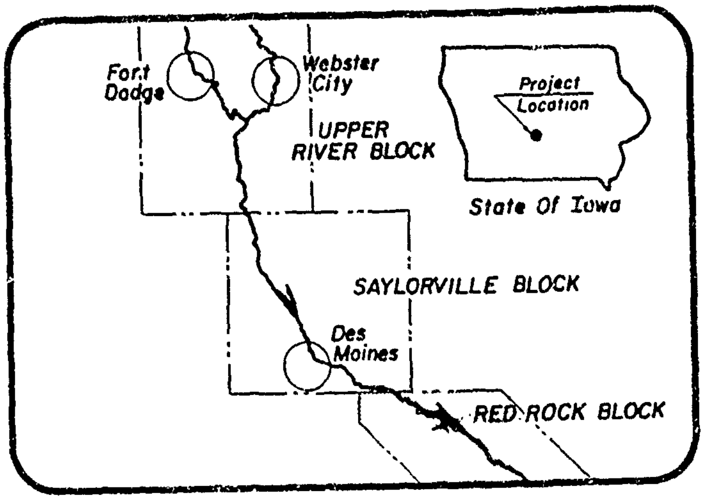


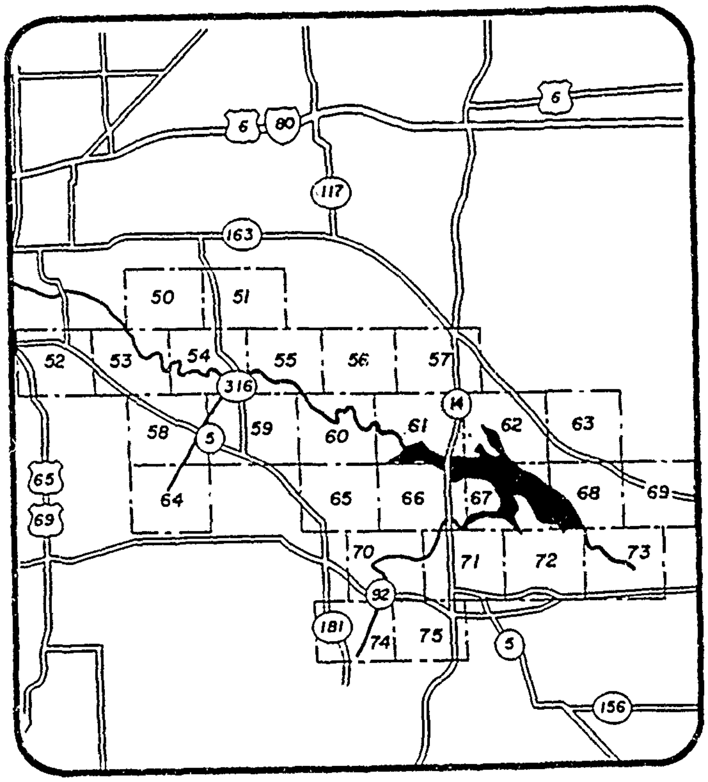
760
755
750
745
740
735
6700
6800
6900
7000
7100
7200
7300
7400
7500
7600
7700
7800
7900
8000
8100
8200
8300
8400
8500
RANGE. NØ. 21-B
CHANNEL
ELEVATION IN FEET -- NATIONAL GEODETIC VERTICAL DATUM OF 1929
LEFT BANK
810
800
790
780
770
760
750
740
730
SAND PIT
J.R. ROAD
WABASH R.R.
FLOOD CONTROL POOL
FIELD BØØK REFERENCES
HØRZ. CØNTRØL N-RR-459 P 2-8
VERT. CØNTRØL N-RR-480 P 2.18-20
ØRIG. PRØFILE N-RR-480 P 2-18
2ND PRØFILE N-RR-531 P 24-27, -539 P 2-9
3RD PRØFILE N-RR-569 P 21-30, -571 P 1-6
TØPØ SHEET LØCATIØN
RR-PT-N13
RR-PT-013A
RR-PT-013B
RANGE NØ. 21-B
MILE 21.B
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
4400
4800
5200
5600
6000
6400
DISTANCE IN FEET

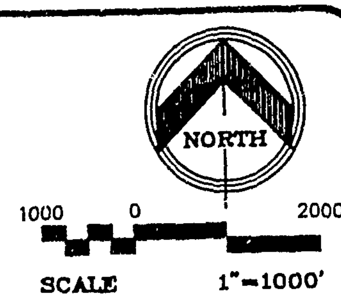


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SEDIMENTATION PROFILE
RANGE NO. 21-B

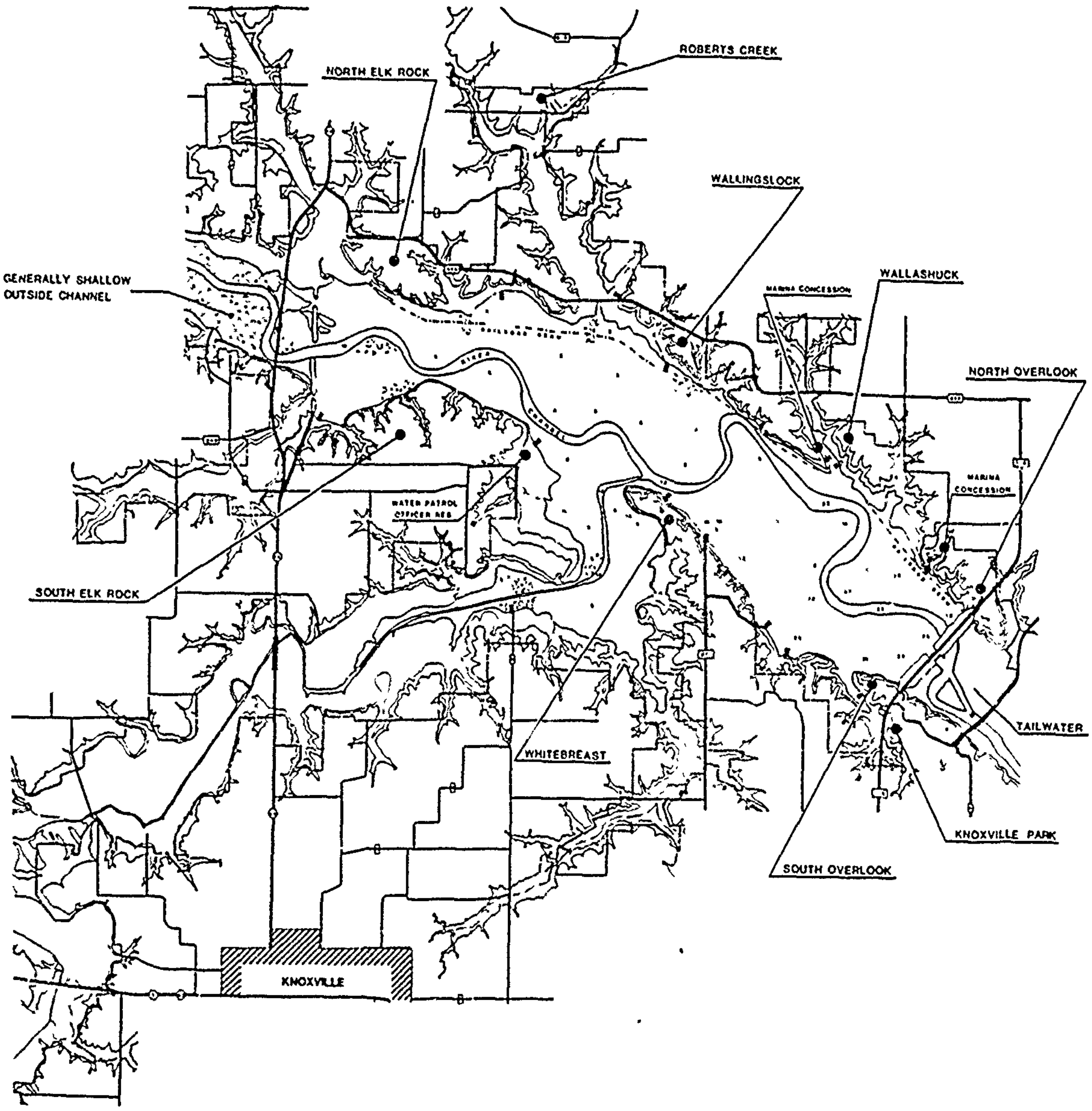






LAKE RED ROCK, IOWA
WATER CONTROL PLAN

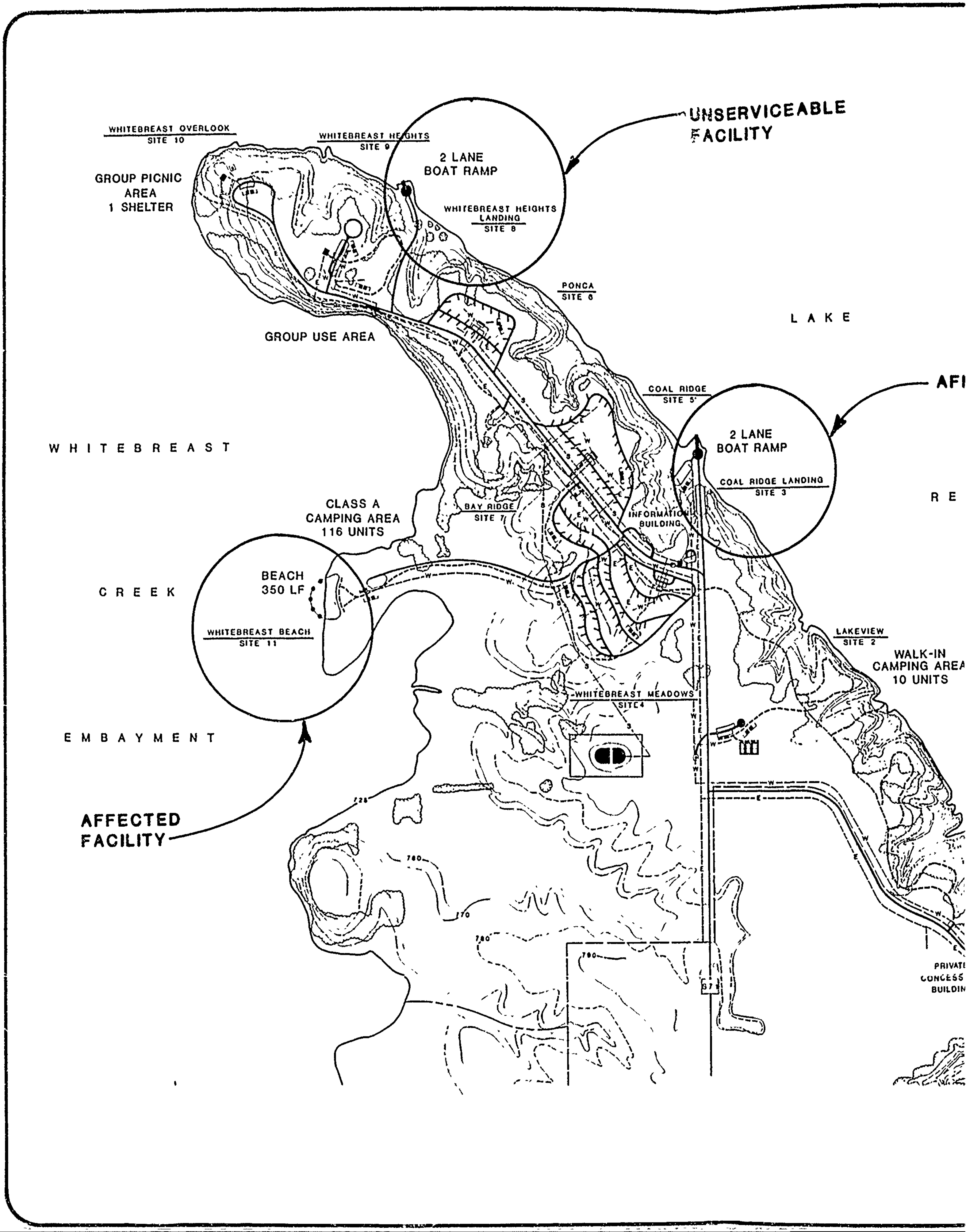
LOCATION OF MUDFLATS

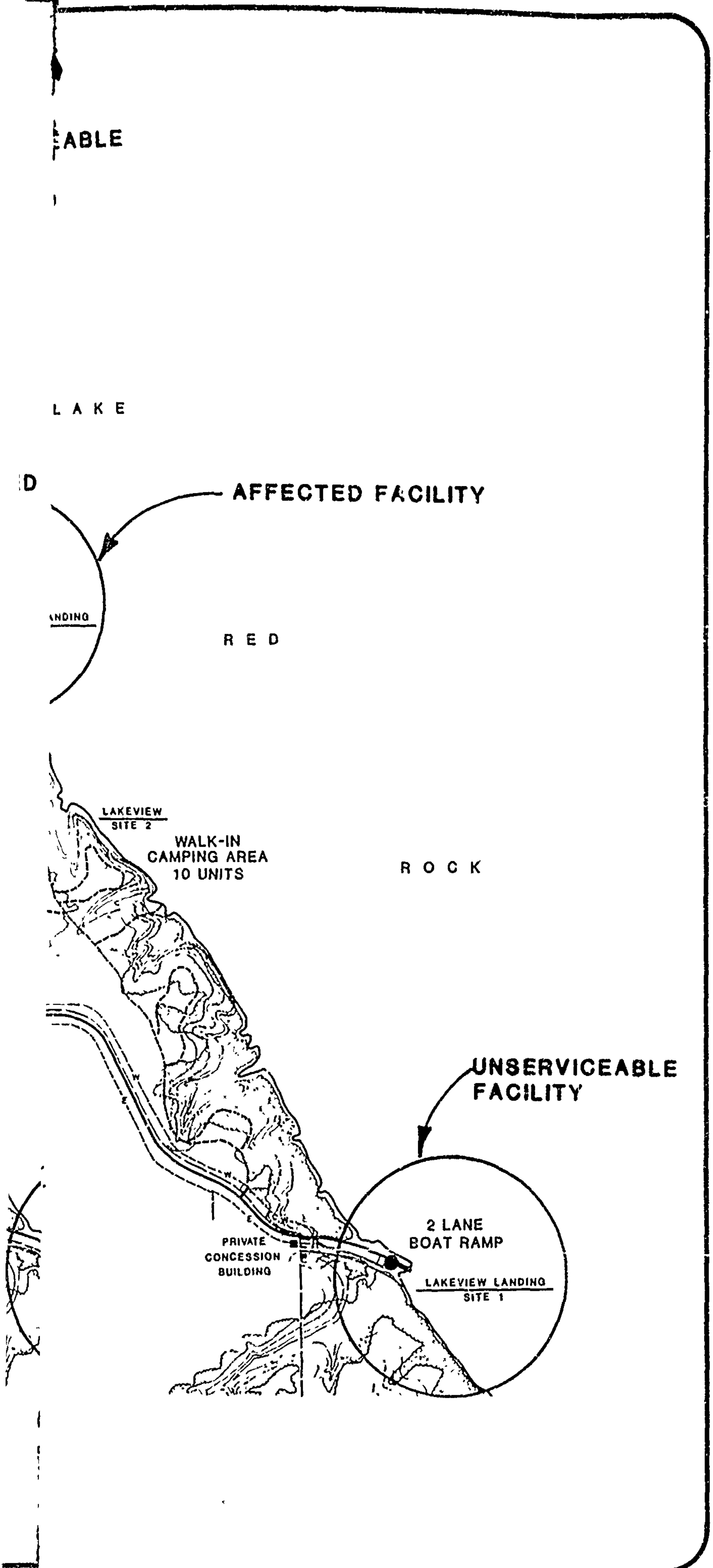


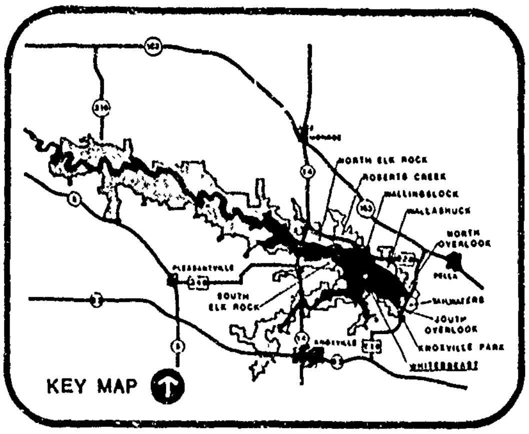
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

RECREATION AREAS

PLATE 26


UNSERVICEABLE FACILITY
WHITEBREAST OVERLOOK
SITE 10
WHITEBREAST HEIGHTS
SITE 9
2 LANE BOAT RAMP
WHITEBREAST HEIGHTS LANDING
SITE 8
GROUP PICNIC AREA
1 SHELTER
PONCA
SITE 6
LAKE
GROUP USE AREA
COAL RIDGE
SITE 5
2 LANE BOAT RAMP
COAL RIDGE LANDING
SITE 3
WHITEBREAST
R E
CLASS A CAMPING AREA
116 UNITS
BAY RIDGE
SITE 7
INFORMATION BUILDING
BEACH
350 LF
CREEK
WHITEBREAST BEACH
SITE 11
LAKEVIEW
SITE 2
WALK-IN
10 UNITS
WHITEBREAST MEADOWS
SITE 4
EMBAYMENT
AFFECTED FACILITY
PRIVAT
BUILDIN





LEGEND

- Project Boundary
- Recreation Boundary
- Conservation Pool
- Five Year Flood Pool
- Flood Pool
- Existing Timber
- Existing State or County Roads

FACILITY DEVELOPMENT

EXISTING

- Project Roads and Parking
- Camping Spurs
- Boat Launching Ramp
- Foot Trail
- Swimming Beach
- Trailer Dumping Station
- Amphitheater
- Picnic Shelter
- Entrance Station
- Bath-Change Shelter
- Comfort Station
- Washhouse
- Vault Toilet
- Fish Cleaning Station
- Sewage Lift Station
- Sewage Lagoon
- Sewers, Electrical or Waterline
- Water Supply
- Facility to be Obliterated

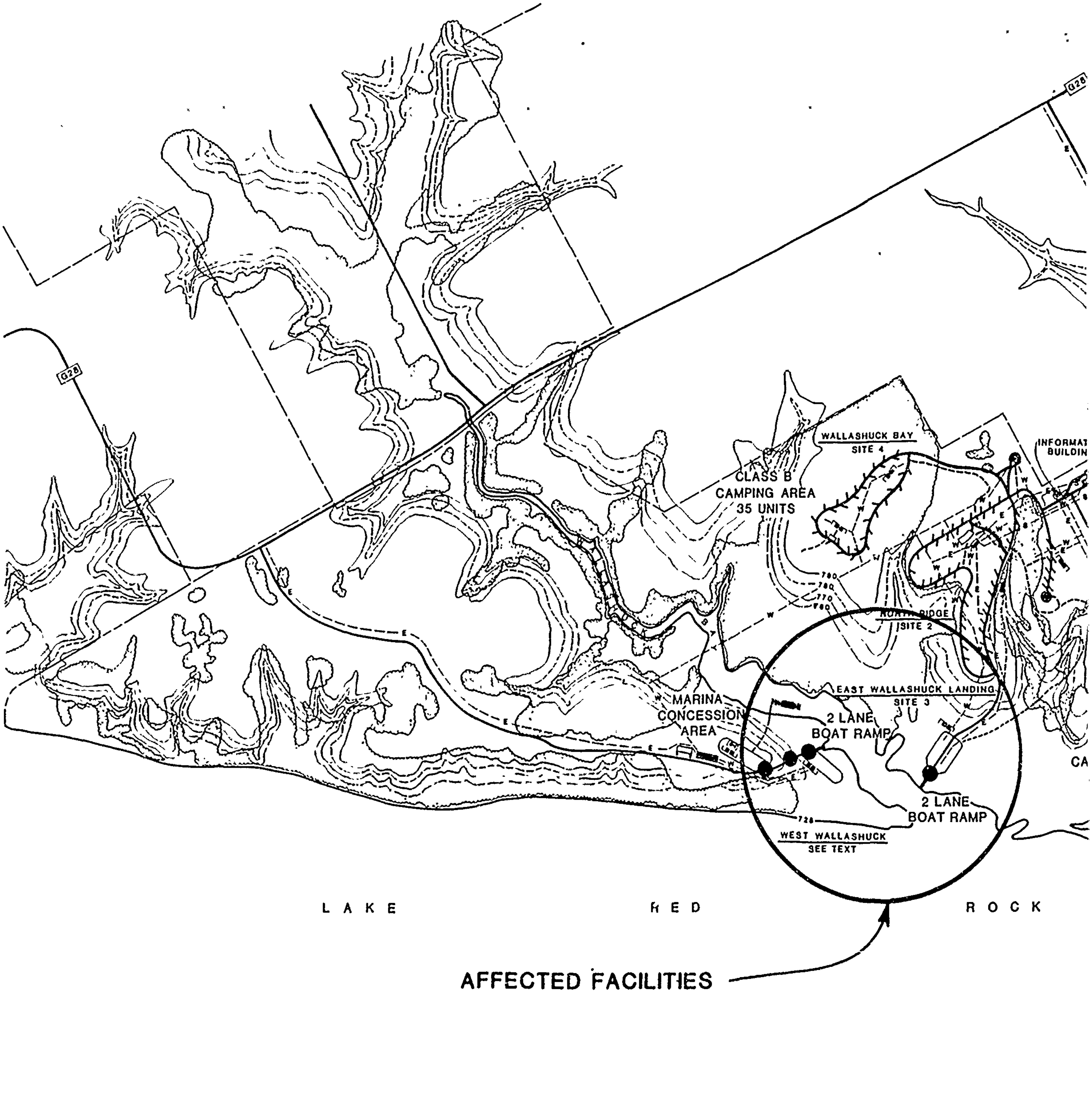
NORTH

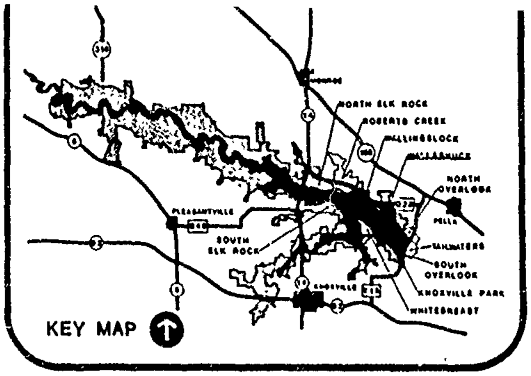
400 800 1200 1600 2000

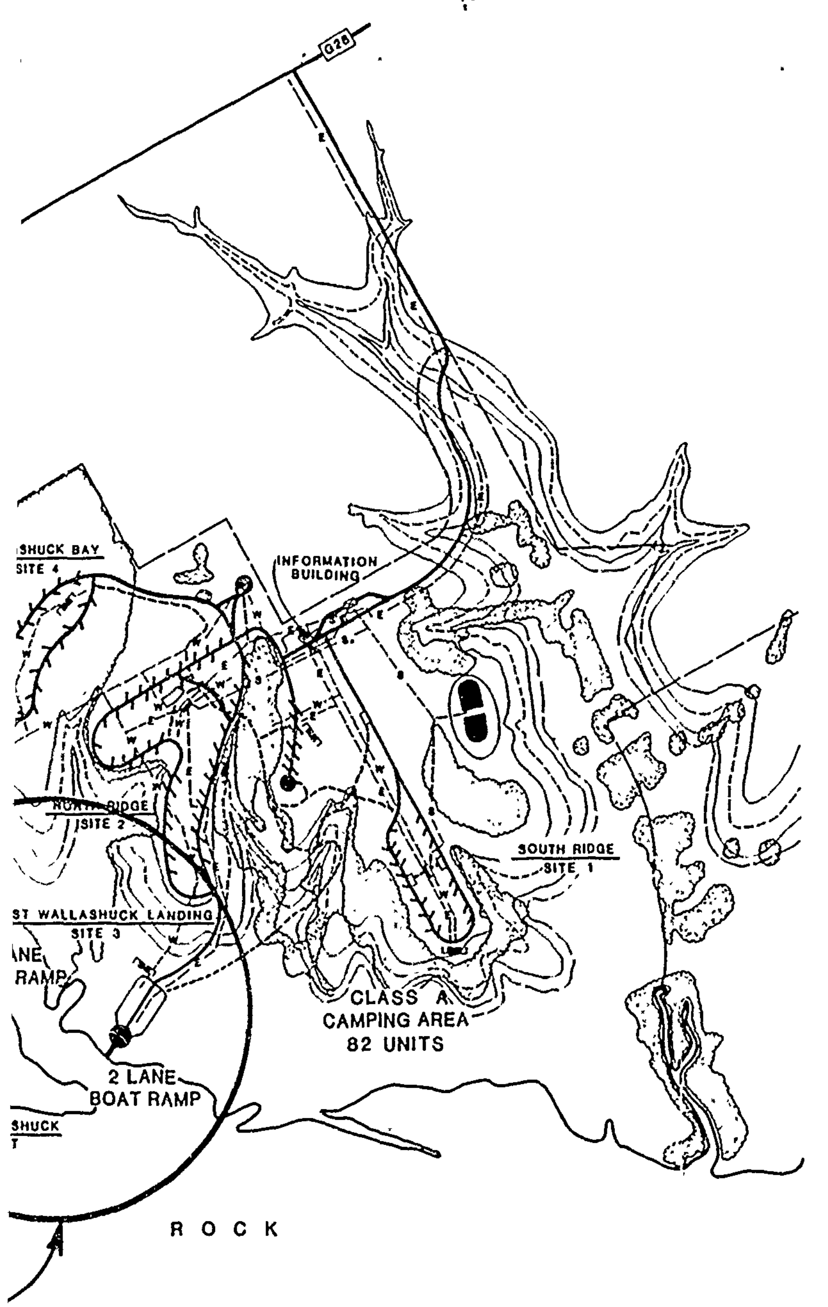
SCALE IN FEET

LAKE RED ROCK, IOWA
WATER CONTROL PLAN

WHITEBREAST RECREATION AREA


G28
WALLASHUCK BAY
SITE 4
INFORMAT
BUILDIN
CLASS B
CAMPING AREA
35 UNITS
SITE 2
EAST WALLASHUCK LANDING
SITE 3
MARINA
CONCESSION
AREA
2 LANE
BOAT RAMP
2 LANE
BOAT RAMP
WEST WALLASHUCK
SEE TEXT
LAKE
RED
ROCK
AFFECTED FACILITIES





LEGEND

- Project Boundary
- Recreation Boundary
- Conservation Pool
- Five Year Flood Pool
- Flood Pool
- Existing Timber
- Existing State or County Roads

FACILITY DEVELOPMENT

EXISTING

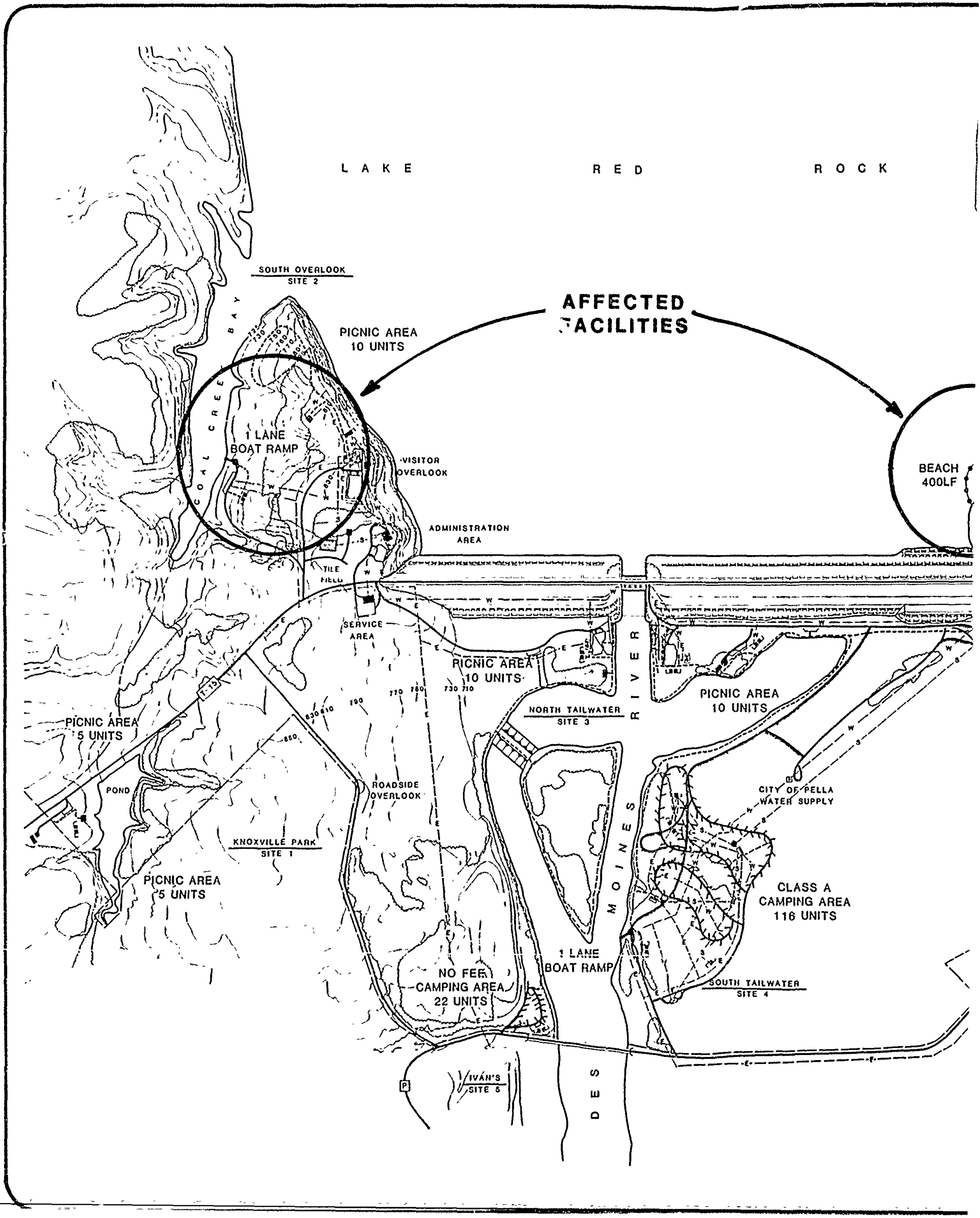
- Project Roads and Parking
- Camping Spurs
- Boat Launching Ramp
- Foot Trail
- Swimming Beach
- Trailer Dumping Station
- Amphitheater
- Picnic Shelter
- Entrance Station
- Bath-Change Shelter
- Comfort Station
- Washhouse
- Vault Toilet
- Fish Cleaning Station
- Sewage Lift Station
- Sewage Lagoon
- Sewers, Electrical or Waterline
- Water Supply
- Facility to be Obliterated

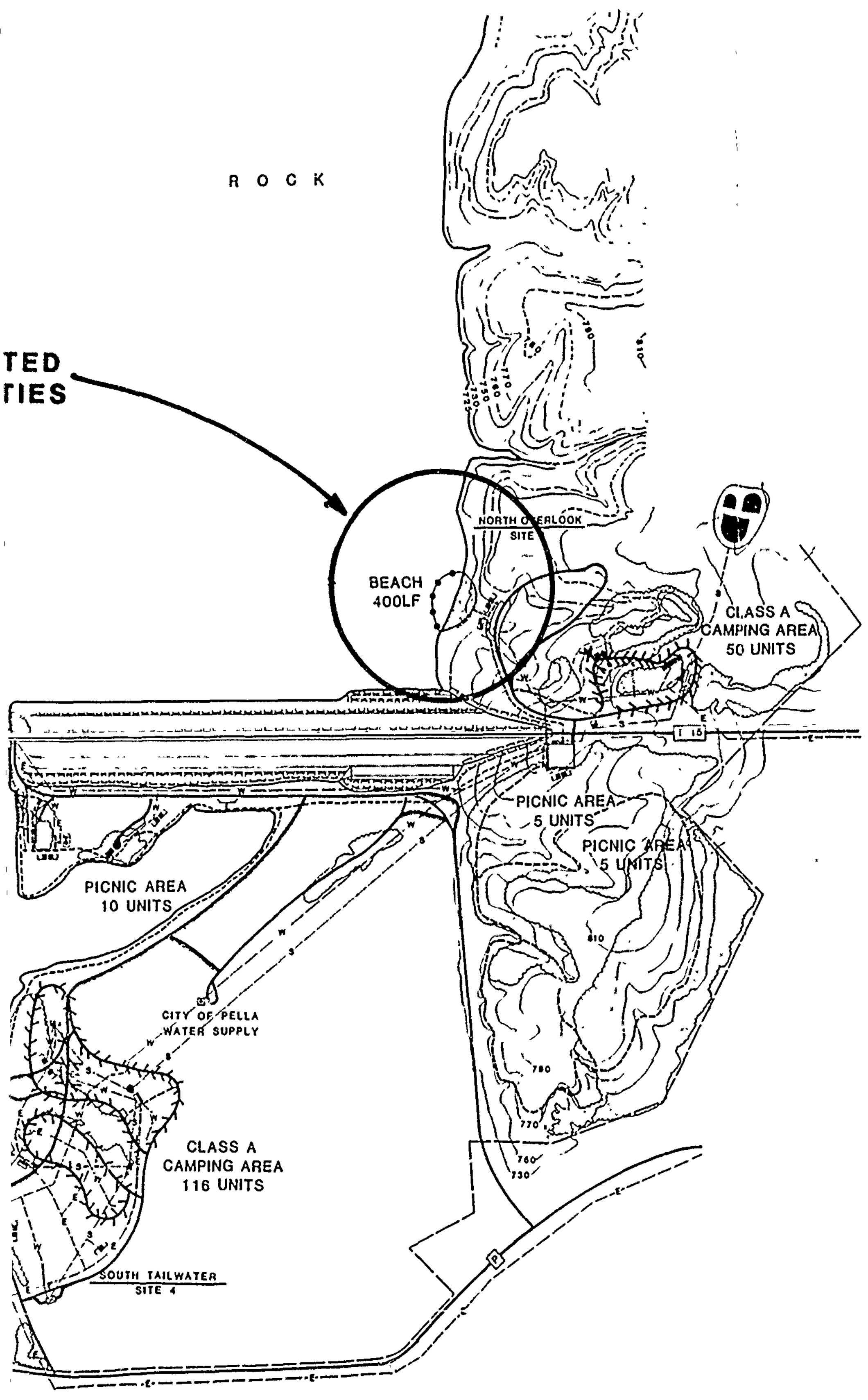
NORTH SCALE IN FEET 400 800 1200 1600 2000

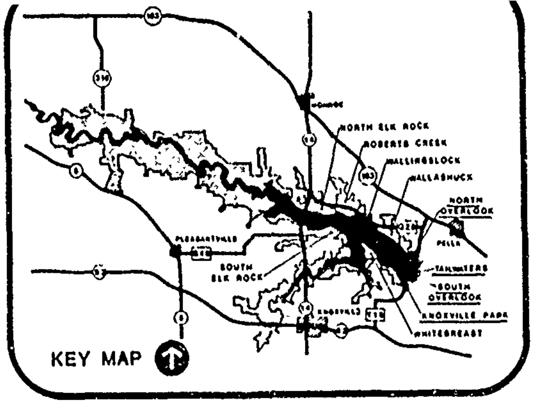
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

WALLASHUCK RECREATION AREA

PLATE 28


LAKE RED ROCK
AFFECTED FACILITIES
SOUTH OVERLOOK SITE 2
COAL CREEK BAY
PICNIC AREA 10 UNITS
1 LANE BOAT RAMP
VISITOR OVERLOOK
BEACH 400LF
ADMINISTRATION AREA
TILE FIELD
SERVICE AREA
PICNIC AREA 10 UNITS
NORTH TAILWATER SITE 3
PICNIC AREA 10 UNITS
PICNIC AREA 5 UNITS
POND
ROADSIDE OVERLOOK
CITY OF PELLA WATER SUPPLY
KNOXVILLE PARK SITE 1
PICNIC AREA 5 UNITS
CLASS A CAMPING AREA 116 UNITS
1 LANE BOAT RAMP
NO FEE CAMPING AREA 22 UNITS
SOUTH TAILWATER SITE 4
IVAN'S SITE 5
DES MOINES RIVER





LEGEND

- Project Boundary
- Recreation Boundary
- Conservation Pool
- Five Year Flood Pool
- Flood Pool
- Existing Timber
- Existing State or County Roads

FACILITY DEVELOPMENT

EXISTING

- Project Roads and Parking
- Camping Spurs
- Boat Launching Ramp
- Foot Trail
- Swimming Beach
- Trailer Dumping Station
- Amphitheater
- Picnic Shelter
- Entrance Station
- Bath-Change Shelter
- Comfort Station
- Washhouse
- Vault Toilet
- Fish Cleaning Station
- Sewage Lift Station
- Sewage Lagoon
- Sewers, Electrical or Waterline
- Water Supply
- Facility to be Obliterated

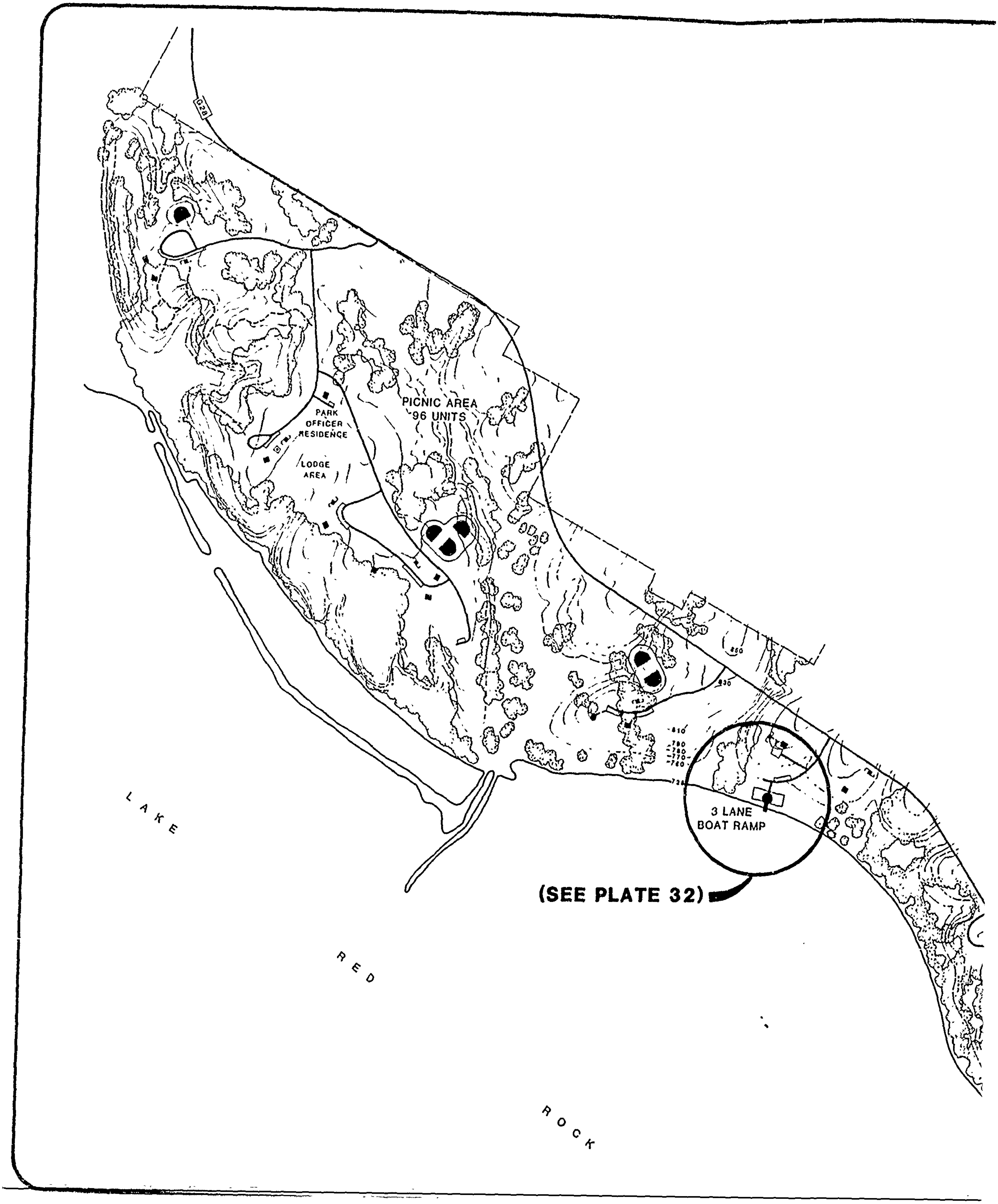
NORTH

400	800	1200	1600	2000

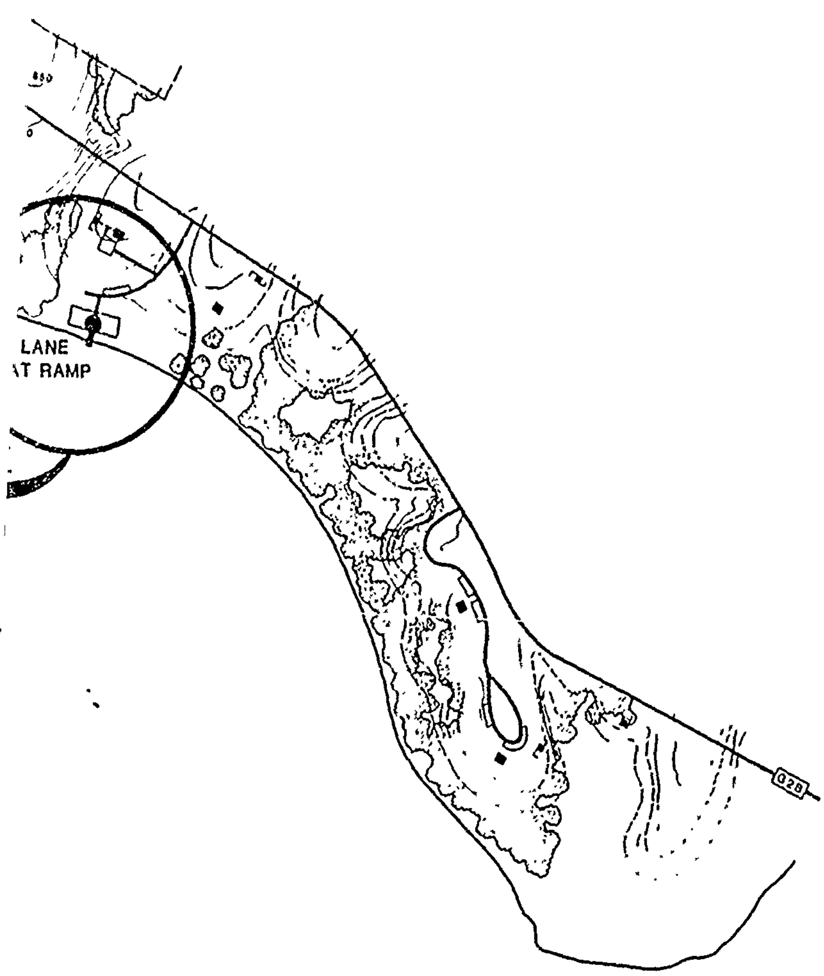
SCALE IN FEET

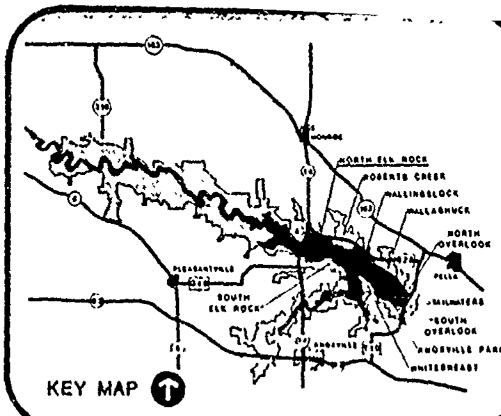
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

RED ROCK DAM RECREATION AREA



PICNIC AREA
96 UNITS
PARK
OFFICER
RESIDENCE
LODGE
AREA
3 LANE
BOAT RAMP
(SEE PLATE 32)
LAKE
RED
ROCK





LEGEND

- Project Boundary
- Recreation Boundary
- Conservation Pool
- Five Year Flood Pool
- Flood Pool
- Existing Timber
- Existing State or County Roads

FACILITY DEVELOPMENT

EXISTING

- Project Roads and Parking
- Camping Spurs
- Boat Launching Ramp
- Foot Trail
- Swimming Beach
- Trailer Dumping Station
- Amphitheater
- Picnic Shelter
- Entrance Station
- Bath-Change Shelter
- Comfort Station
- Washhouse
- Vault Toilet
- Fish Cleaning Station
- Sewage Lift Station
- Sewage Lagoon
- Sewers, Electrical or Waterline
- Water Supply
- Facility to be Obliterated

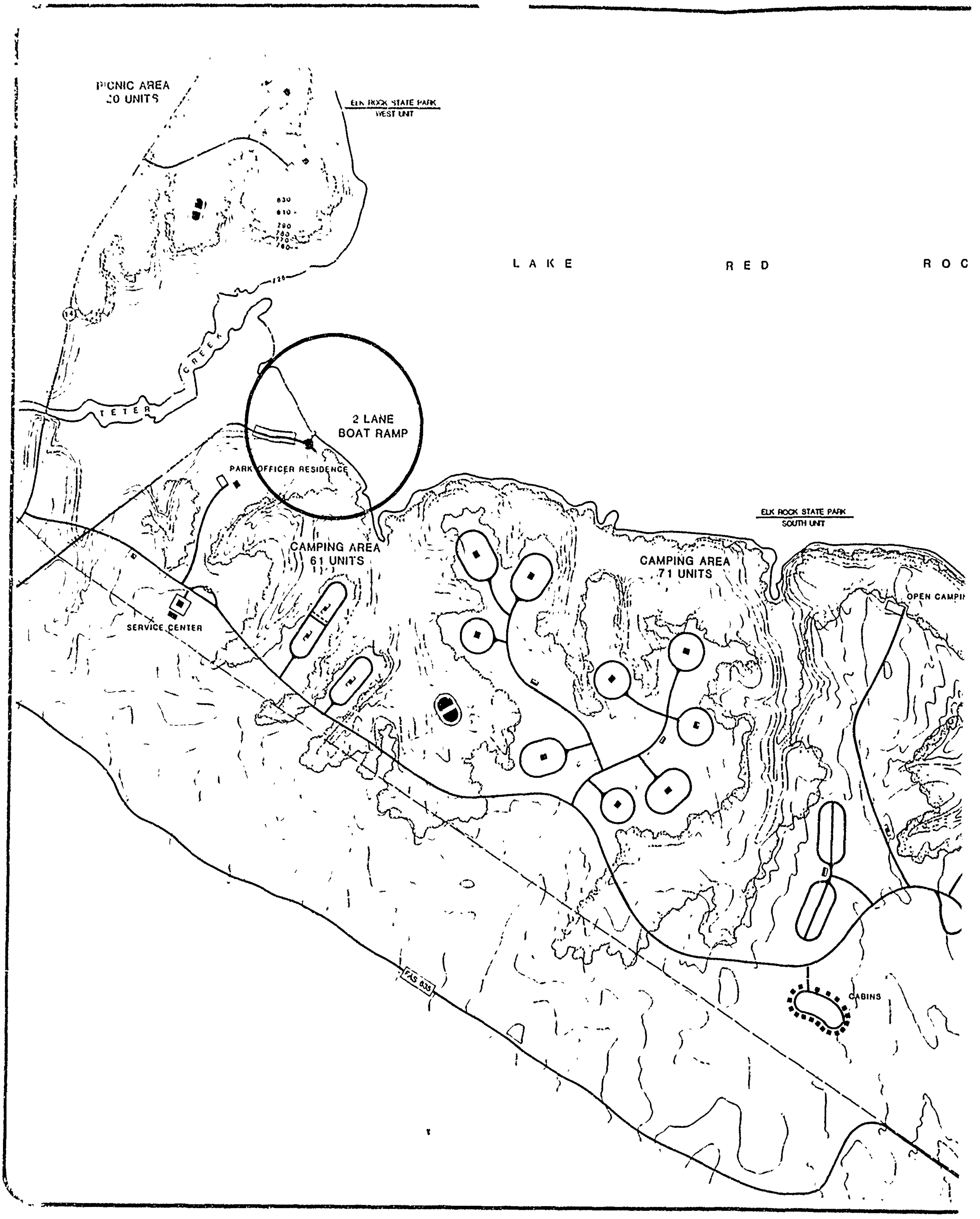
NORTH

400 800 1200 1600 2000

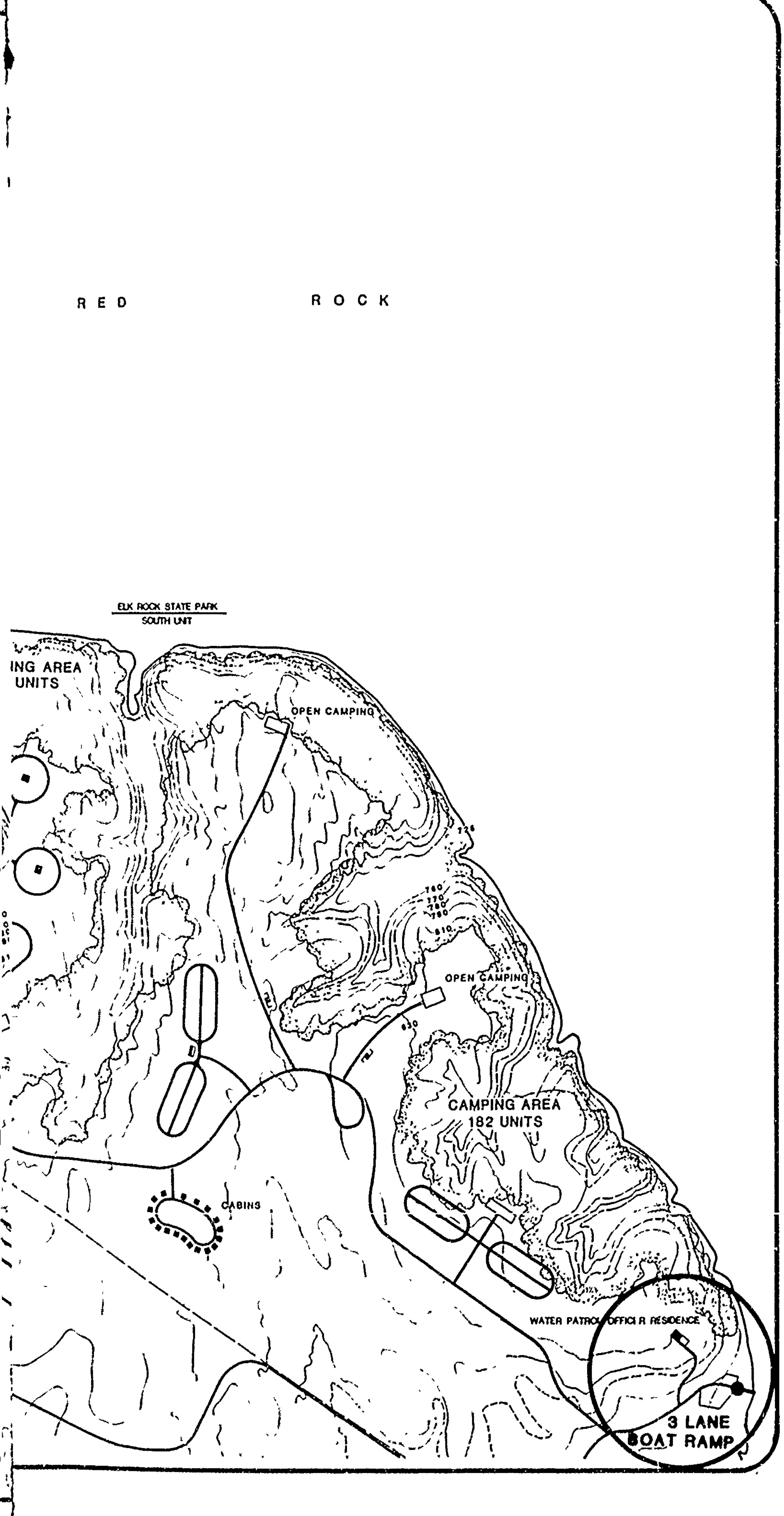
SCALE IN FEET

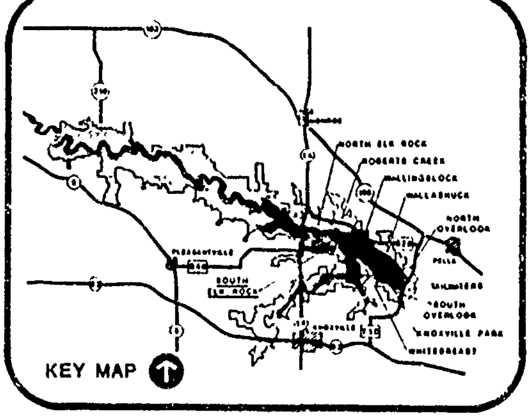
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

NORTH ELK ROCK STATE PARK



PICNIC AREA
20 UNITS
ELK ROCK STATE PARK
WEST UNIT
L A K E
R E D
R O C
TETER CREEK
2 LANE
BOAT RAMP
PARK OFFICER RESIDENCE
CAMPING AREA
61 UNITS
SERVICE CENTER
ELK ROCK STATE PARK
SOUTH UNIT
CAMPING AREA
71 UNITS
OPEN CAMPI
CABINS
FAS 635





LEGEND

—— ——	Project Boundary
----	Recreation Boundary
—725—	Conservation Pool
—760—	Five Year Flood Pool
--780--	Flood Pool
	Existing Timber
—□—○—	Existing State or County Roads

FACILITY DEVELOPMENT

EXISTING

- Project Roads and Parking
- Camping Spurs
- Boat Launching Ramp
- Foot Trail
- Swimming Beach
- Trailer Dumping Station
- Amphitheater
- Picnic Shelter
- Entrance Station
- Bath-Change Shelter
- Comfort Station
- Washhouse
- Vault Toilet
- Fish Cleaning Station
- Sewage Lift Station
- Sewage Lagoon
- Sewers, Electrical or Waterline
- Water Supply
- Facility to be Obliterated

NORTH

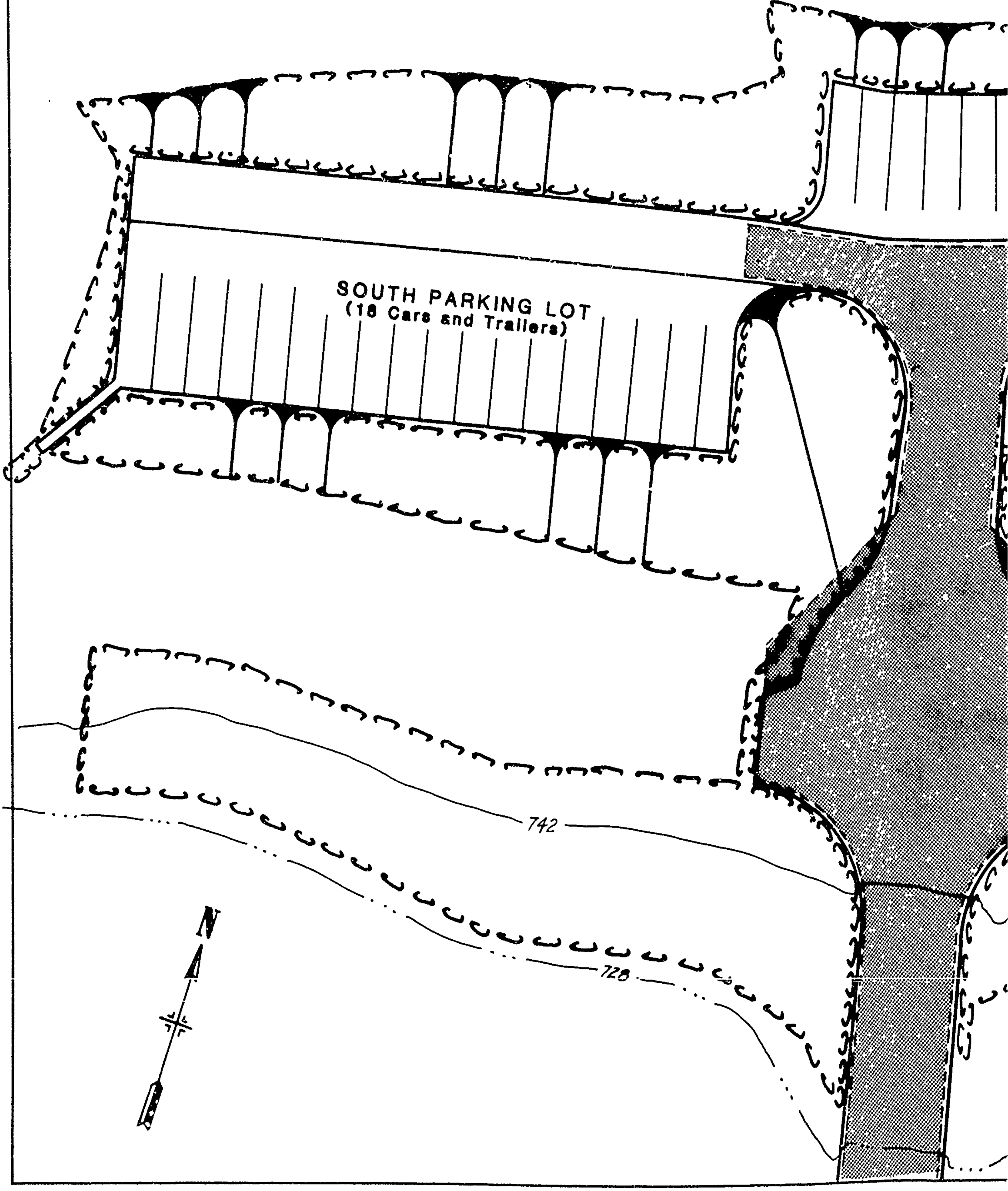
400	800	1200	1600	2000

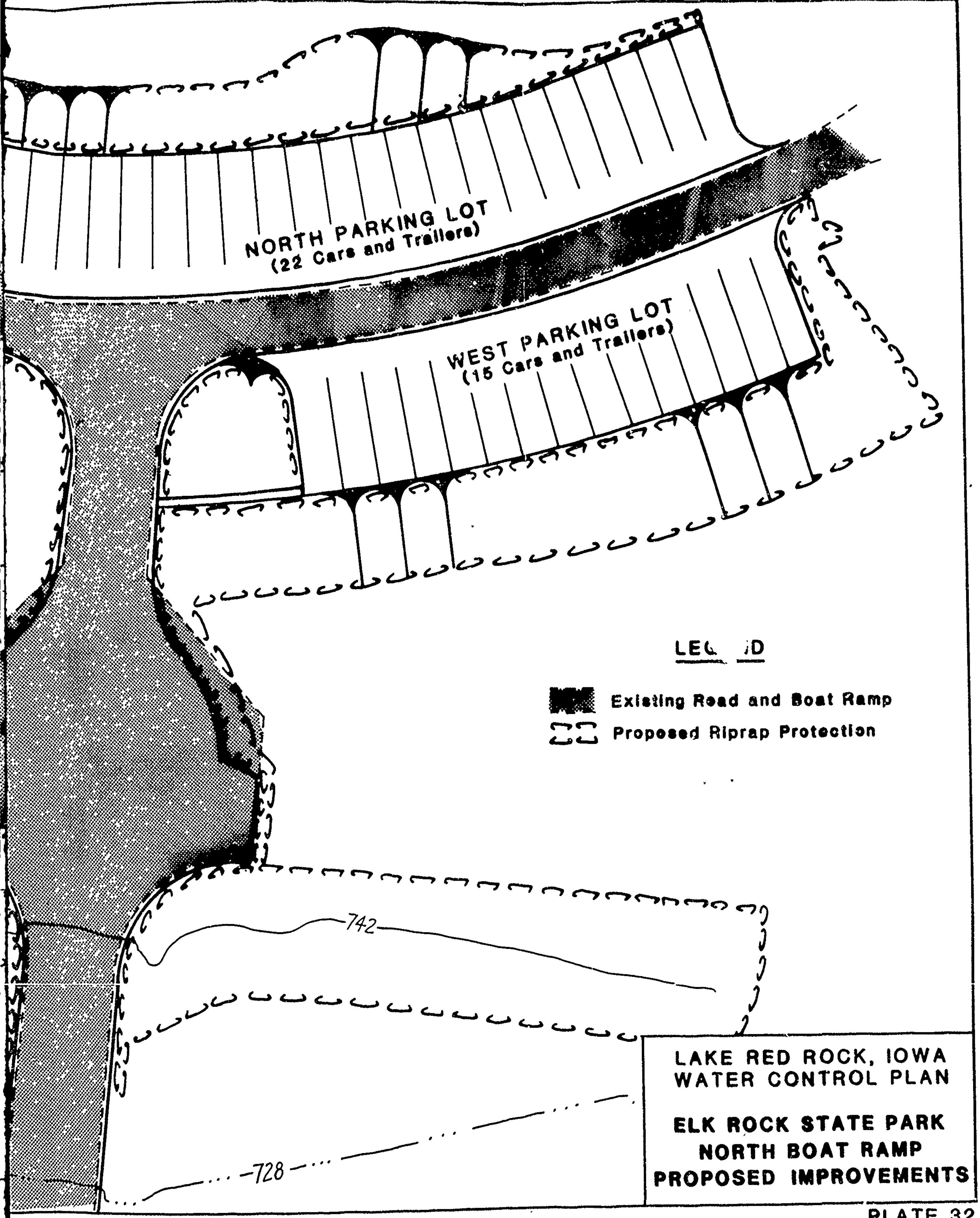
SCALE IN FEET

LAKE RED ROCK, IOWA
WATER CONTROL PLAN

SOUTH ELK ROCK STATE PARK

PLATE 31

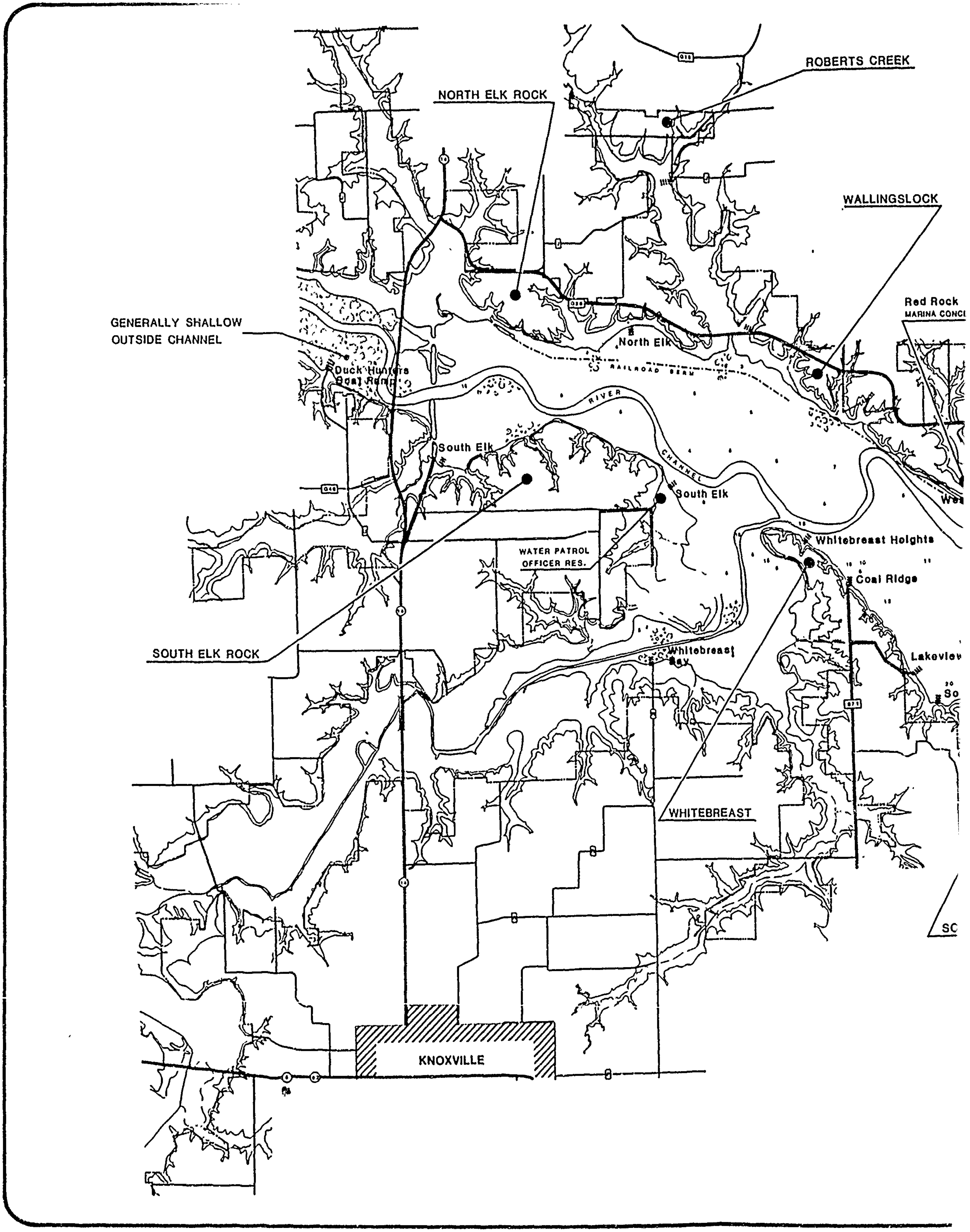

SOUTH PARKING LOT
(18 Cars and Trailers)
742
728
N



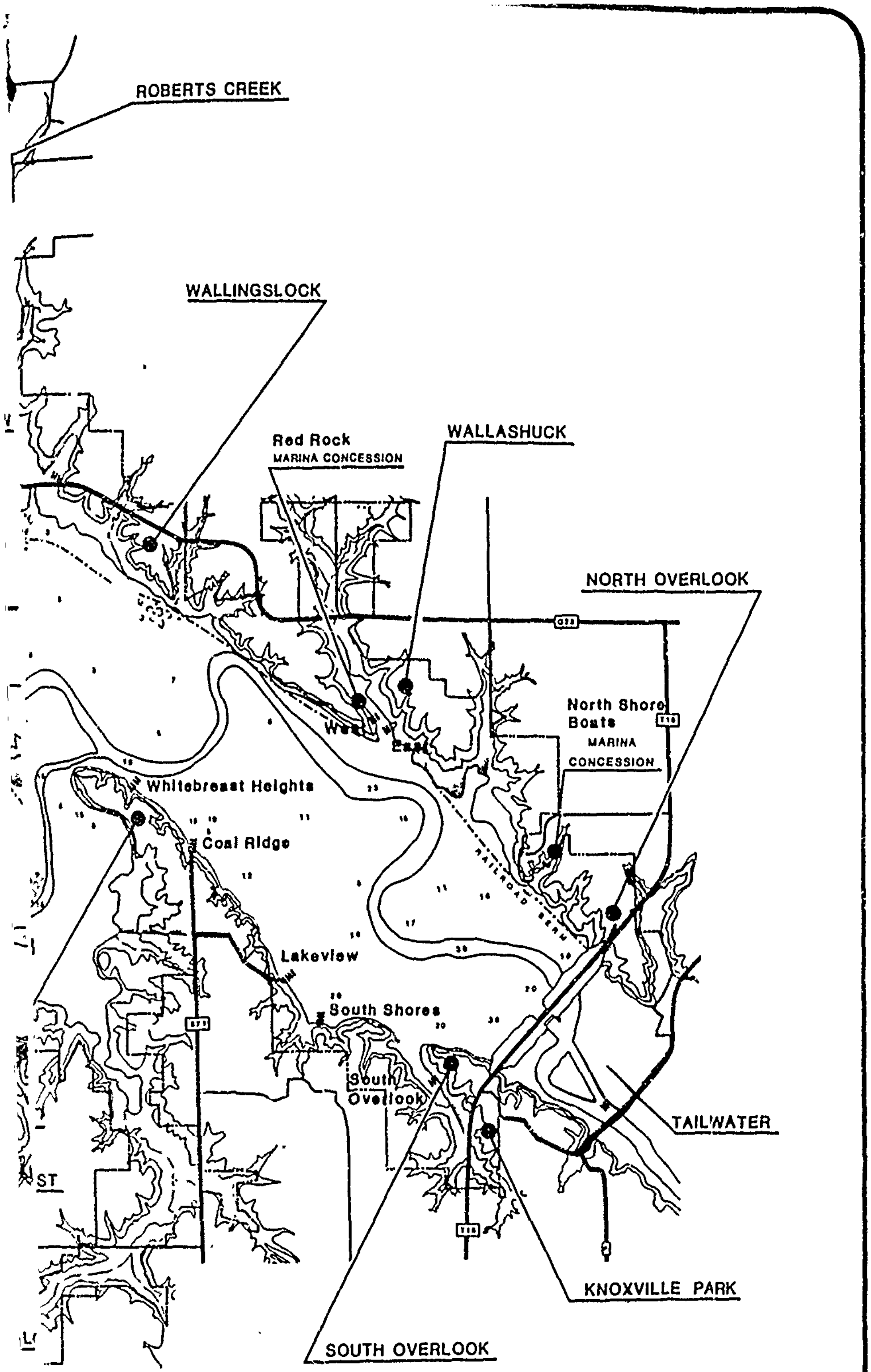
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

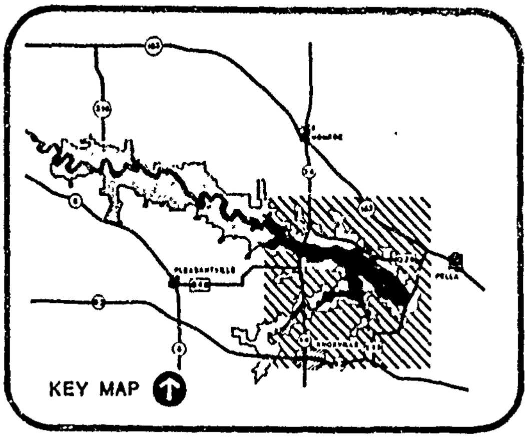
ELK ROCK STATE PARK
NORTH BOAT RAMP
PROPOSED IMPROVEMENTS

PLATE 32



ROBERTS CREEK
NORTH ELK ROCK
WALLINGSLOCK
Red Rock
GENERALLY SHALLOW
OUTSIDE CHANNEL
North Elk
RAILROAD BERM
Duck Hunters
Boat Ramp
RIVER
CHANNEL
South Elk
South Elk
Whitebreast Heights
Coal Ridge
WATER PATROL
OFFICER RES.
SOUTH ELK ROCK
Whitebreast
Bay
Lakeview
WHITEBREAST
KNOXVILLE





LEGEND

- Operations: Recreation-Intensive Use
- Project Boundary
- County Boundary
- 725 Conservation Pool
- 760 5 Yr. Flood Pool
- 783 Flood Pool
- Hard Surface Road
- Gravel Road
- ·'·nimproved Road
- ·te Highway
- ·ounty Highway
- Boat Ramp
- 20 Elevation at 725 M.S.L.
- Stumps

NORTH

1000 2000 3000 4000 5000

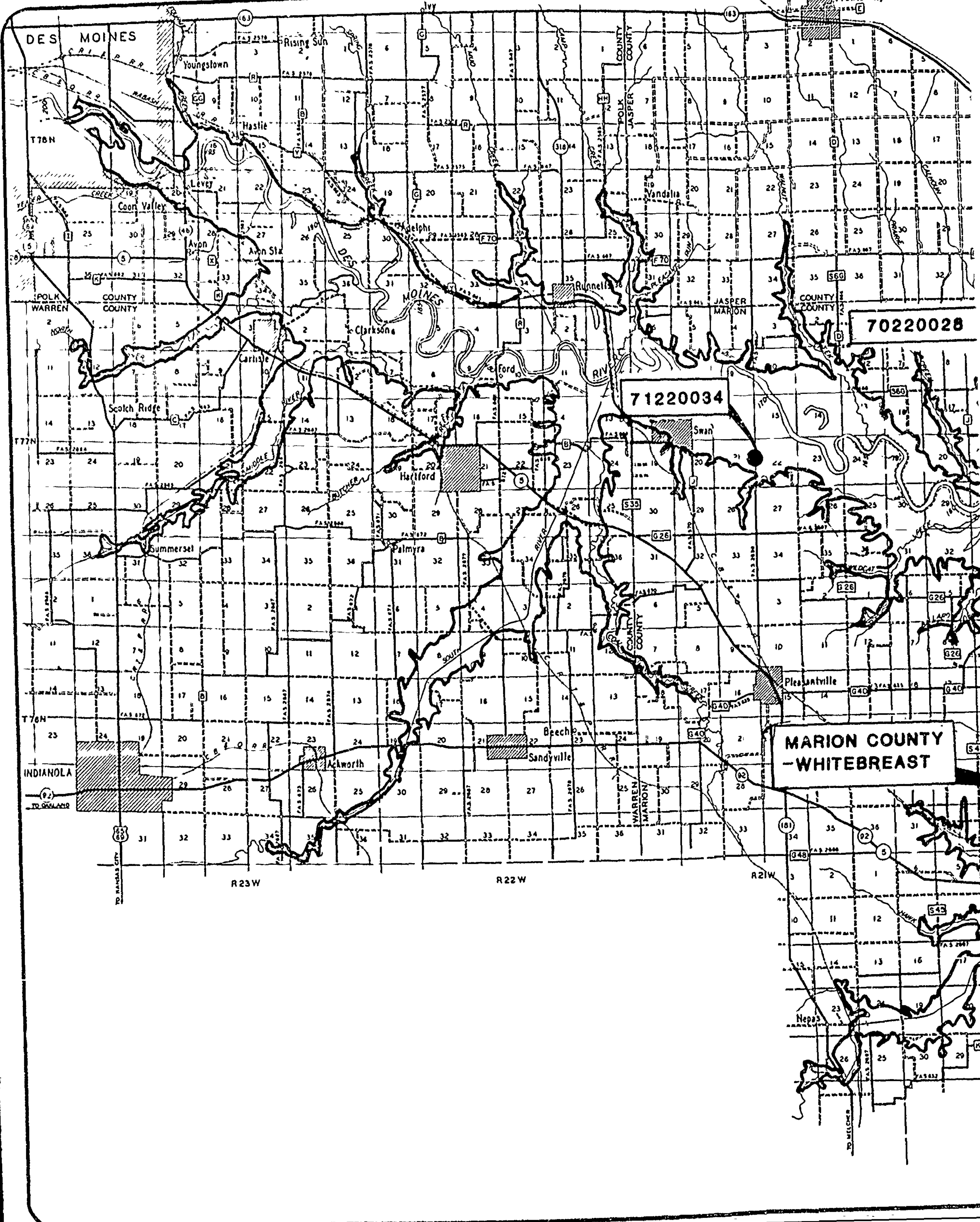
SCALE IN FEET

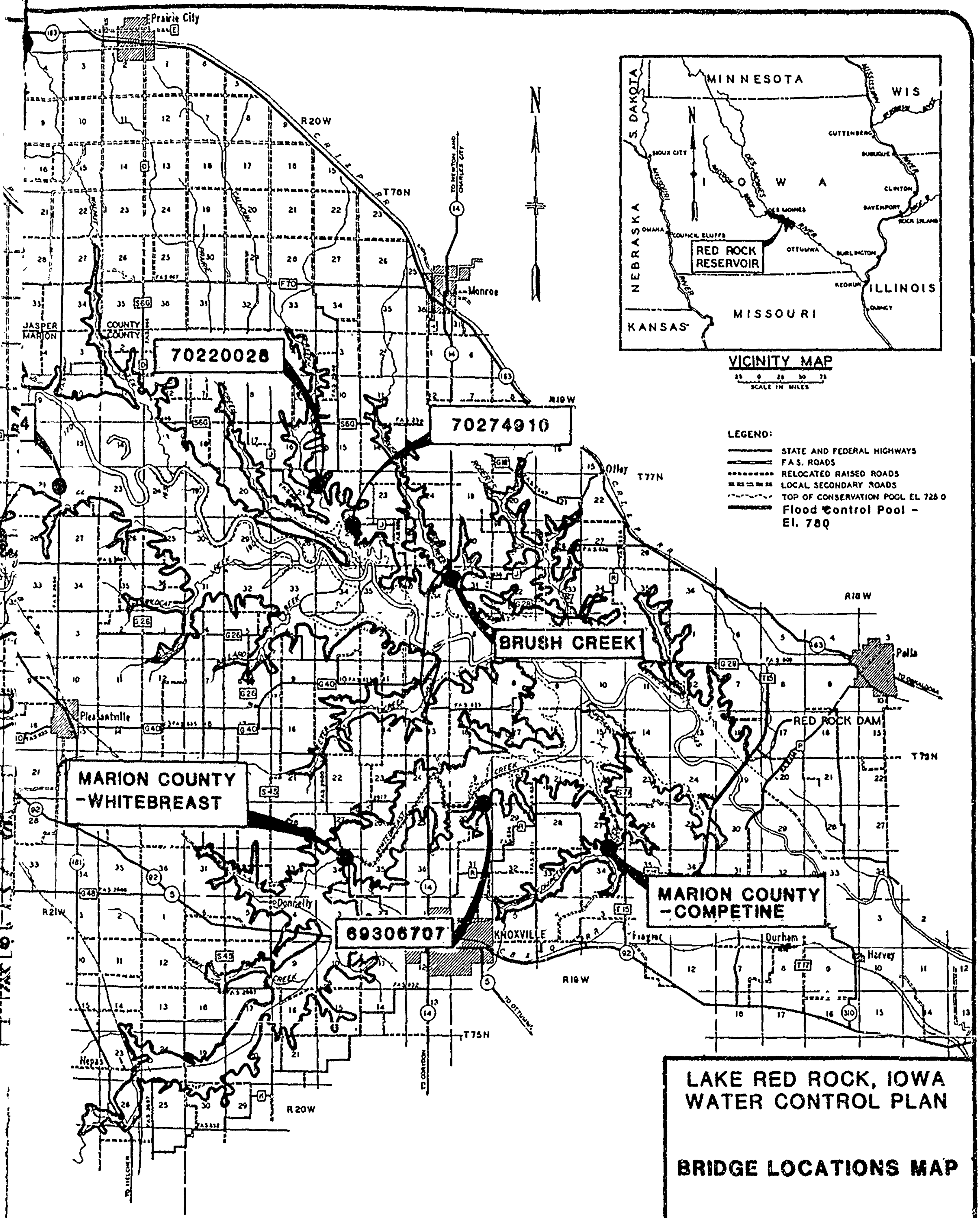
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

BOAT RAMP LOCATION

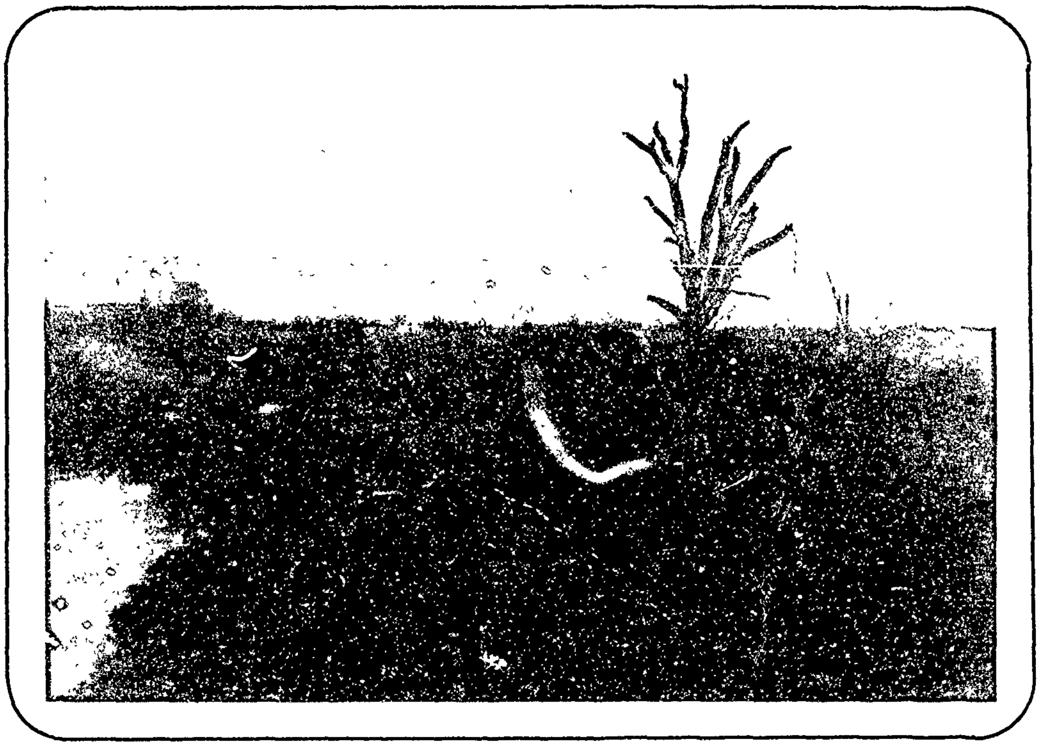
PLATE 33

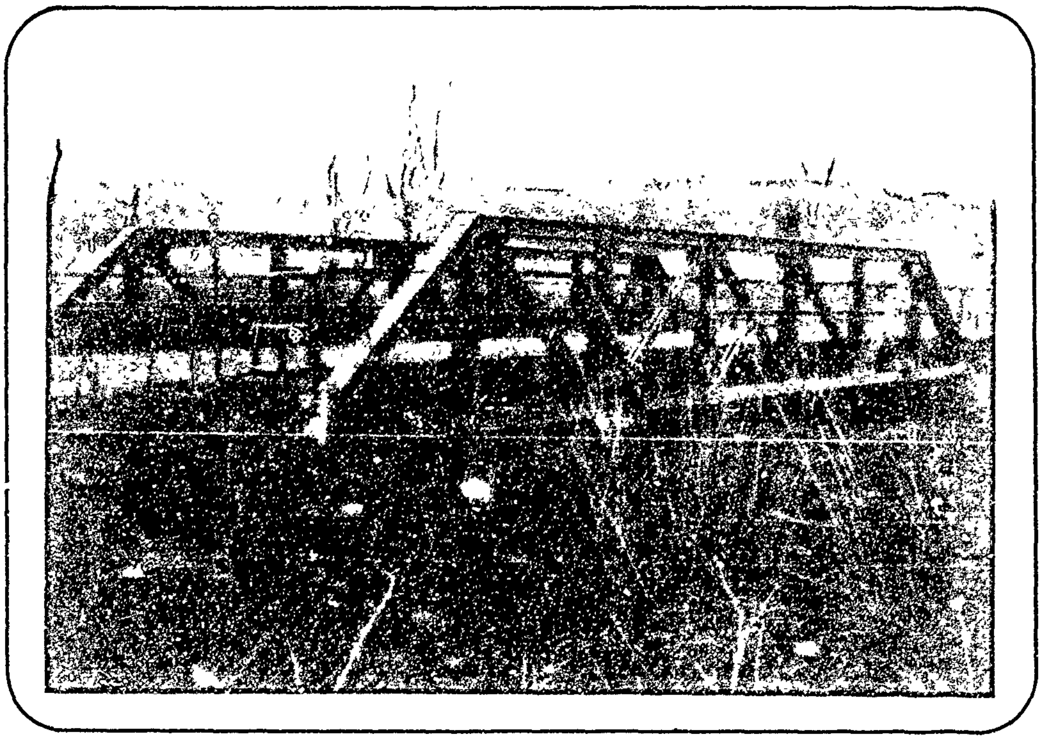
CORPS OF ENGINEERS





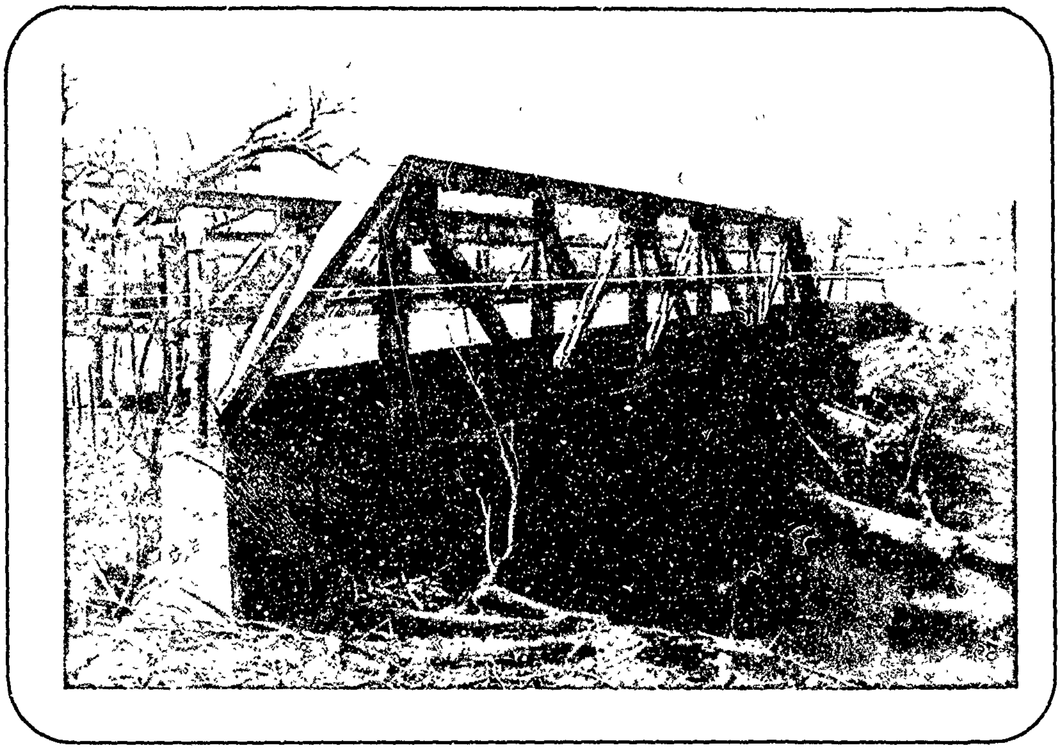
LAKE RED ROCK, IOWA
WATER CONTROL PLAN
BRIDGE LOCATIONS MAP
70220028
70274910
BRUSH CREEK
MARION COUNTY -WHITEBREAST
MARION COUNTY -COMPETINE
69306707
RED ROCK DAM
Prairie City
Monroe
Pella
Pleasantville
KNOXVILLE
Donnelly
Otley
Durham
Harvey
Nepas
JASPER COUNTY
MARION COUNTY
T78N
T77N
T76N
T75N
R21W
R20W
R19W
R18W
LEGEND:
STATE AND FEDERAL HIGHWAYS
F.A.S. ROADS
RELOCATED RAISED ROADS
LOCAL SECONDARY ROADS
TOP OF CONSERVATION POOL EL 725.0
Flood Control Pool - El. 780
VICINITY MAP
SCALE IN MILES
MINNESOTA
WIS
S. DAKOTA
IOWA
NEBRASKA
ILLINOIS
MISSOURI
KANSAS
RED ROCK RESERVOIR





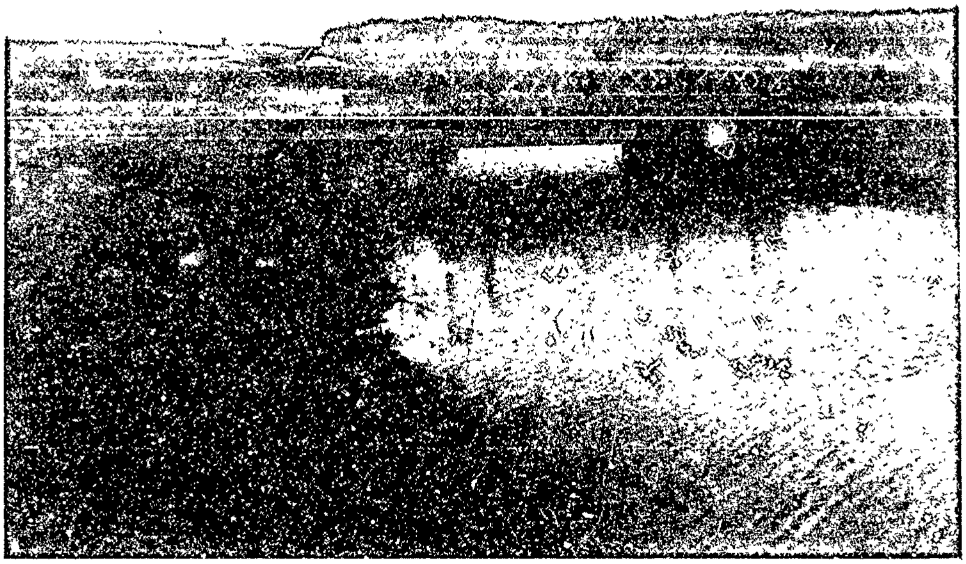
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

BRIDGE NO. 70274910
PHOTOGRAPHS



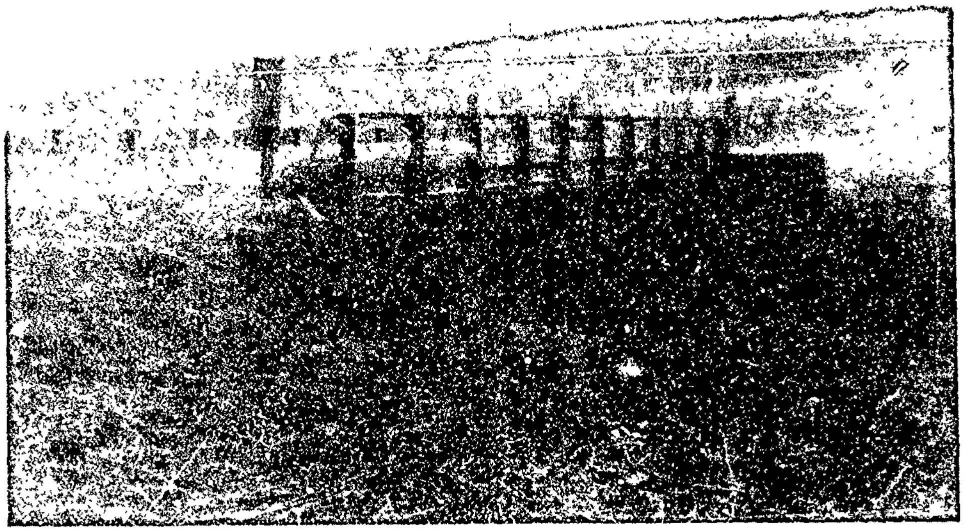
LAKE RED ROCK, IOWA
WATER CONTROL PLAN

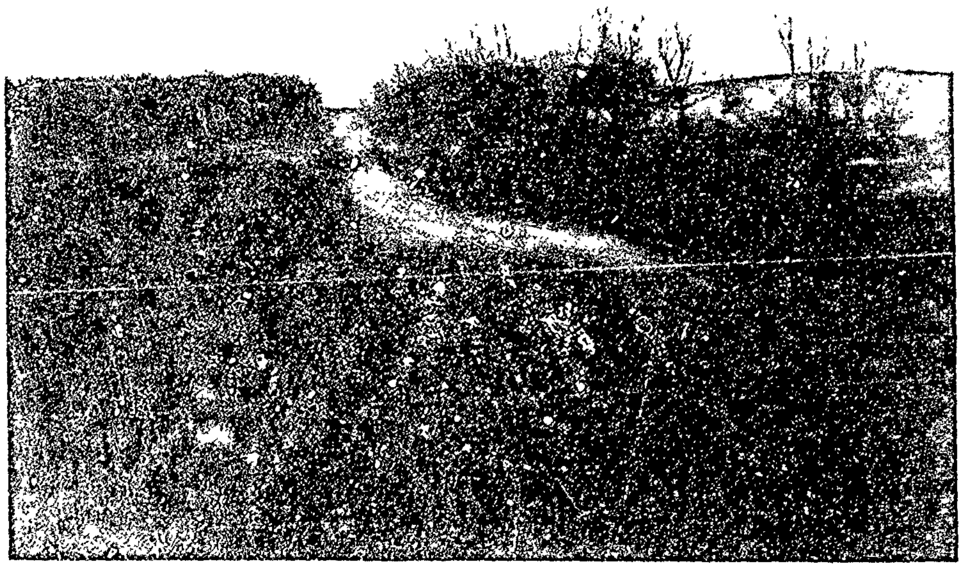
BRIDGE NO. 70220028
PHOTOGRAPHS



LAKE RED ROCK, IOWA
WATER CONTROL PLAN

BRIDGE NO. 71220034
PHOTOGRAPHS

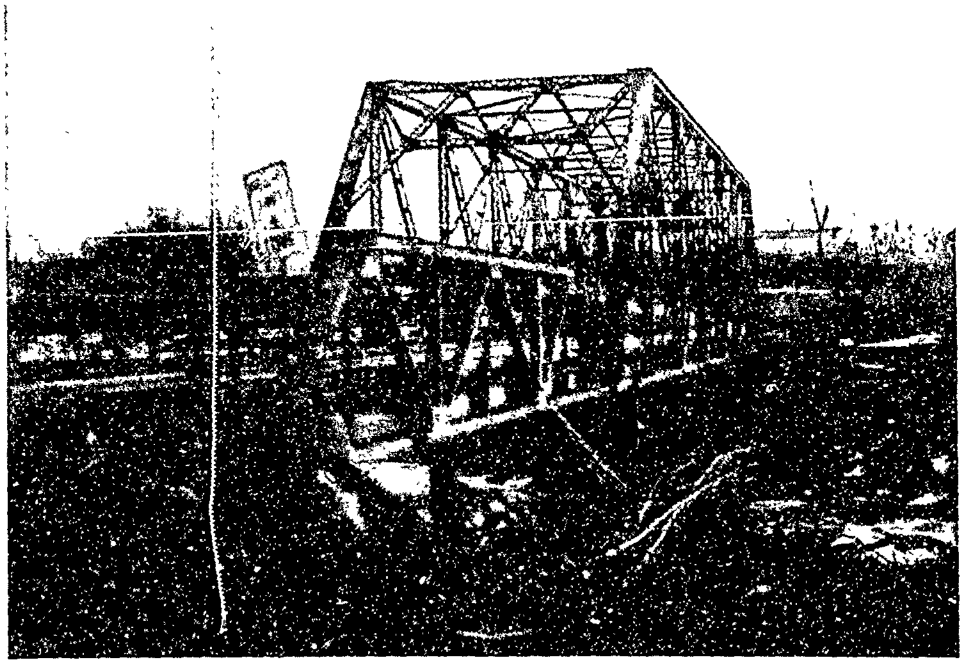




LAKE RED ROCK, IOWA
WATER CONTROL PLAN

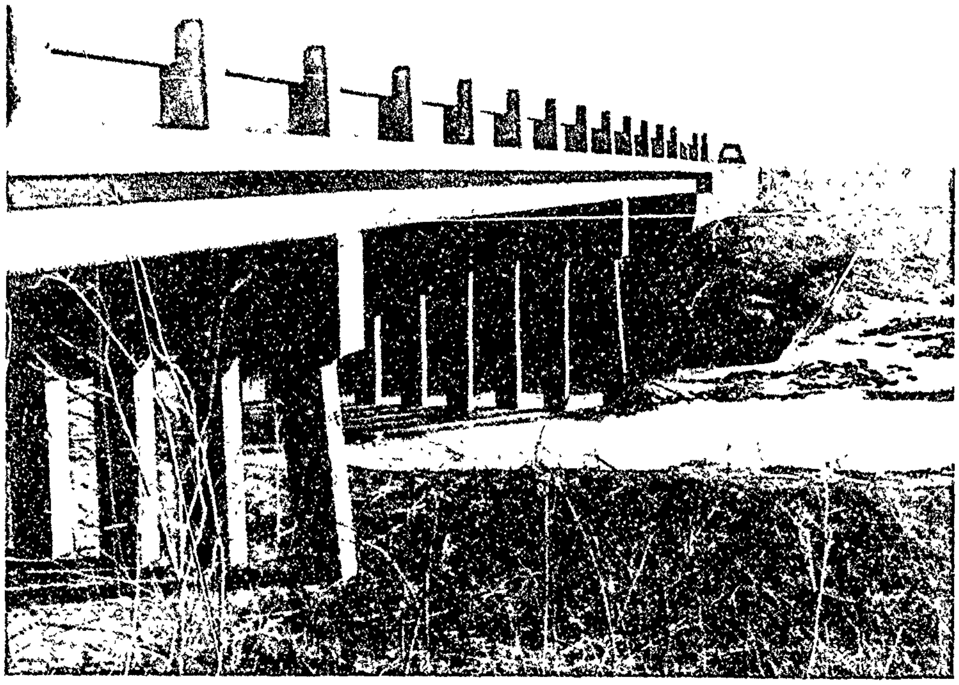
MARION COUNTY BRIDGE
COMPETINE CREEK
PHOTOGRAPHS

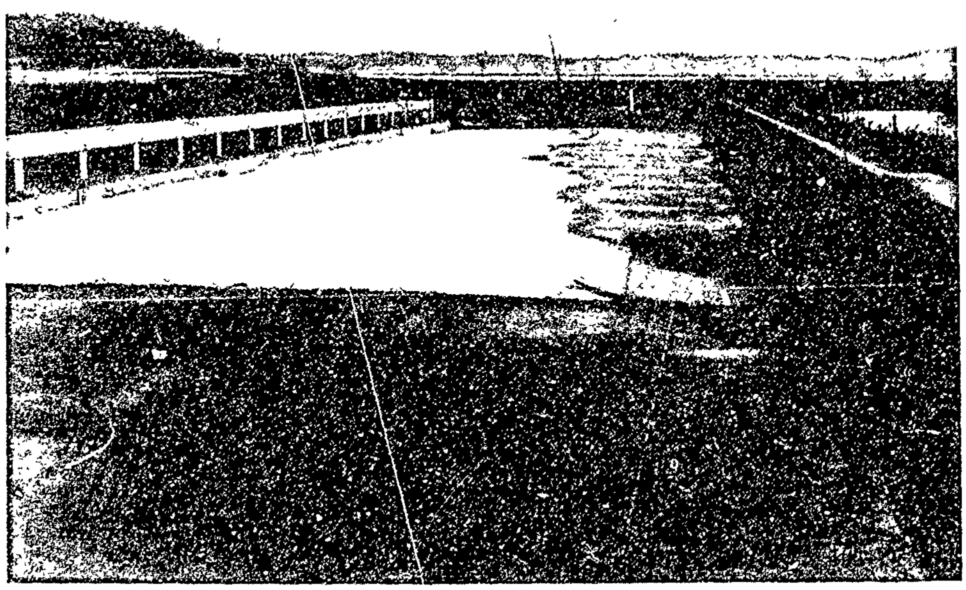
PLATE 38



LAKE RED ROCK, IOWA
WATER CONTROL PLAN

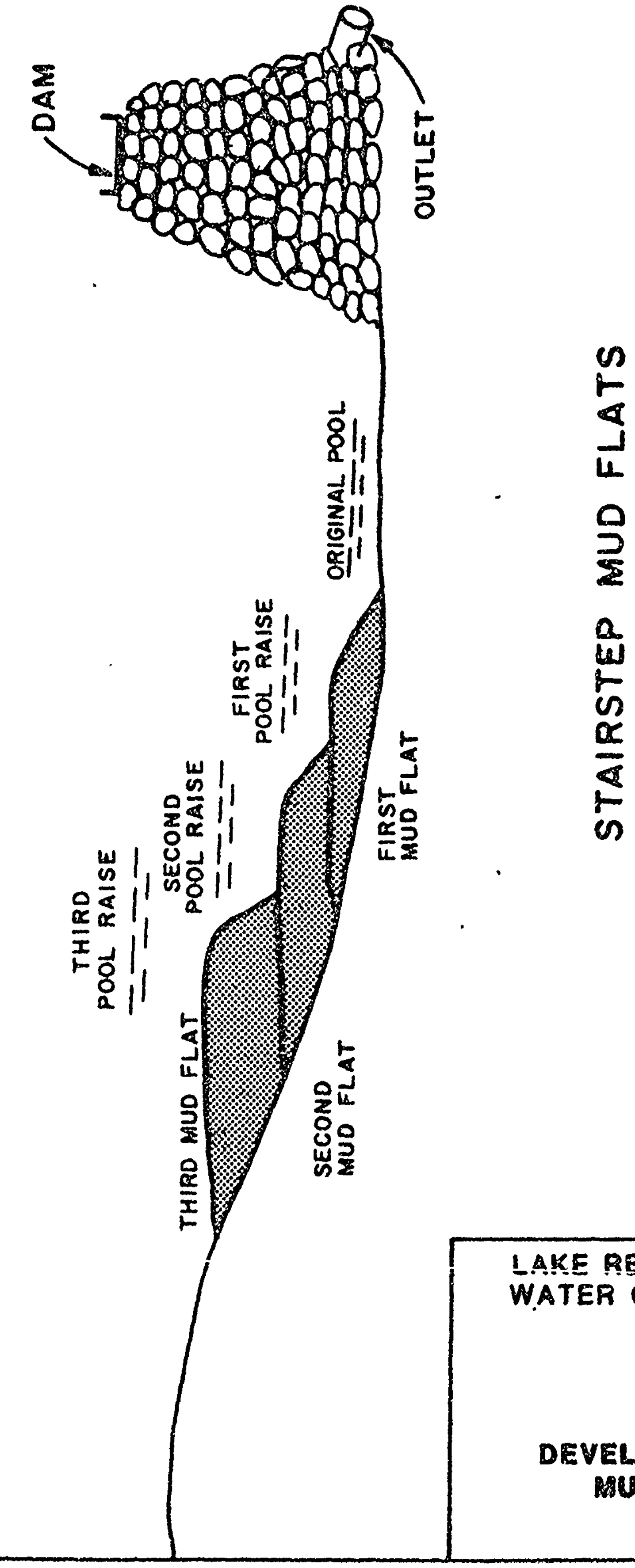
**MARION COUNTY BRIDGE
WHITEBREAST CREEK
PHOTOGRAPH**





LAKE RED ROCK, IOWA
WATER CONTROL PLAN

BRUSH CREEK BRIDGE PHOTOGRAPHS



LAKE RED ROCK, IOWA
WATER CONTROL PLAN

DEVELOPMENT OF MUDFLATS

LIST OF APPENDIXES

REGULATION EVALUATION

APPENDIX A

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX A
REGULATION EVALUATION

TABLE OF CONTENTS

List of Tables

List of Plates

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX A
REGULATION EVALUATION

GENERAL

Lake Red Rock is regulated in accordance with the schedule contained in the Master Reservoir Regulation Manual for Lake Red Rock, published on 26 June 1968, and as modified by subsequent approvals by the North Central Division, Corps of Engineers, to change the pool level to elevation 728.0 feet National Geodetic Vertical Datum (NGVD) and 730.0 feet NGVD.

POOL LEVELS

The conservation pool is normally maintained at 728 feet NGVD. The pool may be raised up to 2 additional feet during periods when levels above 728 feet NGVD might be beneficial to fish and/or wildlife and no adverse effect on flood control would result. Normally a raise to 730 feet NGVD is accomplished in the fall prior to the migratory waterfowl season.

FLOW REGULATION

Outflows are regulated not to exceed 30,000 cubic feet per second (ft^3/s) during the non-growing season (December 16 - April 20, inclusive) and not to exceed 18,000 ft^3/s during the growing season (April 21 - December 15, inclusive). The outflows also are regulated during periods of downstream flooding (December 16 - April 20) so as not to exceed 30,000 ft^3/s at the Ottumwa, Iowa, gage (approximately 10.9-foot stage) or 35,000 ft^3/s at the Keosauqua, Iowa, gage (approximately 20.8-foot stage). Outflows are regulated during periods of downstream flooding (April 21 - December 15) so as not to exceed 18,000 ft^3/s at the Ottumwa gage (approximately 7.5-foot stage) or 22,000 ft^3/s at the Keosauqua gage (approximately 17.5-foot stage). During periods of flooding on the Mississippi River, additional constraints are used related to stages at Burlington, Iowa, and Quincy, Illinois.

EMERGENCY REGULATION

When the reservoir exceeds elevation 775 feet NGVD, higher outflows are made to ensure the safety of the dam. When the pool level is predicted to go above elevation 775, releases are made to ensure that the expected

inflow may be contained in the remaining storage of the full flood pool (elevation 780 feet NGVD). At elevation 785 feet NGVD, the spillway tainter gates are opened as necessary to maintain a reservoir elevation of 785 feet NGVD until the uncontrolled spillway and outlet conduit discharges prevail.

STORAGE BALANCING

In cases when both Saylorville Lake and Lake Red Rock have stored floodwater and Saylorville Lake is below 860 feet NGVD, the storage utilized is balanced percentage-wise. Outflow from the two projects is adjusted within constraints to evacuate as much stored water as possible from the more-full project while holding flood storage constant at the less-full project.

WATER SUPPLY AND LOW-FLOW AUGMENTATION

Low-flow augmentation releases are made as required in accordance with schedules in the regulation manual and as agreed upon by the Des Moines Water Works, Iowa Southern Utilities, and the State of Iowa. Low-flow augmentation objectives are to provide a minimum flow in the Des Moines River at Ottumwa of 300 ft^3/s. Releases for water supply are made from Saylorville Lake as requested by the State of Iowa. Lake Red Rock is not authorized or utilized for water supply storage. The water supply storage is controlled at Saylorville Lake and releases are passed downstream for use.

CONSERVATION STORAGE

Red Rock Reservoir has 50,000 acre-feet of storage allocated for low-flow augmentation to maintain 300 ft^3/s at Ottumwa, Iowa. The period of record for the Red Rock Pool Raise Study includes three major drought periods: 1936-1940, 1955-1957, and 1976-1977. All three droughts reached their most severe points in the winter months. Because of this, conservation storage must contain a volume equal to the water stored as ice which is not available for water quality releases, plus the required volume to augment flows. The volume for ice is taken to be 1 foot of water on the 742 foot NGVD pool, or 19,000 acre-feet. The 742 pool was used because it contains the largest surface area and therefore will require the most volume for water lost to ice, and because all the plans end with a 742-foot conservation pool.

Saylorville provides conservation flow to Red Rock Reservoir. During the most severe droughts, Saylorville fails to provide all of the conservation flow that Red Rock needs. The SAYRED computer model used to simulate the operation of Saylorville and Red Rock Dams for this study showed a shortage

of 22,330 acre-feet for the 1936-1940 drought, a 30,480 acre-foot shortage for the 1955-1957 drought, and a 26,850 acre-foot shortage for the 1976-1977 drought. The model does not take into account ice storage, so adding this to the shortage volumes of the three events gives, in order, 41,330 acre-feet, 49,480 acre-feet, and 45,850 acre-feet needed for conservation storage at Red Rock to provide 300 ft^3/s at Ottumwa, Iowa.

The most severe drought in terms of conservation storage needed at Red Rock Reservoir was the 1955-1957 event which required 49,480 acre-feet. This event is approximately the 100-year or 1 percent event (actually the 1.1 percent drought) based on the 64 years of record (1921-1984) analyzed. Therefore, 50,000 acre-feet of conservation storage is required at Red Rock Reservoir.

SAYRED MODEL

As mentioned above, the Rock Island District uses a computer program (SAYRED) to model the tandem operation of Saylorville Lake and Lake Red Rock. The model was developed in the Rock Island District and is used to examine alternative operation plans at both reservoirs. The SAYRED model develops storage and outflow relationships for given regulation constraints and inflow conditions.

Input to the SAYRED model consists of a file of unregulated average daily flows on the Des Moines River at Saylorville, SE. 14th Street, Lake Red Rock, Ottumwa, and Keosauqua for the period of record (1921-1984). Additional input consists of a file of daily adjusted evaporation rates and the Mississippi River stages at Burlington, Iowa, and Quincy, Illinois.

SAYRED routes the flow at Lake Red Rock to Ottumwa where it is subtracted from the Ottumwa natural flow to obtain an Ottumwa local flow. The flow at Lake Red Rock also is routed to Keosauqua where it is subtracted from the Keosauqua natural flow to get a Keosauqua local flow. The conservation pool, downstream constraints, emergency release schedule, and the area capacity curve for both Lake Red Rock and Saylorville Lake are read into SAYRED from an input file at run time.

SAYRED takes the inflow to Saylorville Lake and calculates an outflow based on outflow constraints and the pool elevation. The program calculates a new pool elevation and the percent storage utilized, along with the hold-out (i.e., inflow minus outflow, from the reservoir). The hold-out is routed to SE. 14th Street where it is subtracted from the natural flow to get the modified SE. 14th Street flow. The modified flow is checked against constraints and, if it is not within allowable limits, a new Saylorville Lake release is calculated and the process is repeated until a suitable release is found. The hold-out is then routed down to Lake Red Rock where it is subtracted from the natural Lake Red Rock inflow to obtain a Lake Red Rock modified inflow.

An outflow for Lake Red Rock is calculated based on the modified inflow, the pool elevation, and outflow constraints. A new pool elevation and the percent storage utilized is calculated for Lake Red Rock. The reservoir release is routed down to Ottumwa and Keosauqua where the local flows are added on, giving Ottumwa and Keosauqua modified flows. These modified flows are checked against constraints and, if they are outside suitable limits, a new Lake Red Rock release is calculated and the process is repeated until a suitable release is found.

The percentages of storage at Lake Red Rock and Saylorville Lake are compared. If they are not within proper limits, a new Saylorville Lake release is calculated and the process is repeated until all constraints are met.

REGULATION SCHEDULE

In September 1984, the Rock Island District studied 23 different operation plans for Lake Red Rock to determine the overall effect of specific components in the operation plan. From this study came the following recommended changes to the June 1968 operation schedule:

a. Extend the non-growing season from April 20 to April 30.

b. Change the flow constraints from 18,000 ft^3/s to 22,000 ft^3/s for Lake Red Rock releases during the growing season when the pool is above 760 feet NGVD.

c. Raise the pool elevacion from 755.5 and 763.5 to 757.0 and 765.0, respectively, for which the maximum outflow from Lake Red Rock is increased during Mississippi River flooding.

d. Make the 2-foot fall pool raise a permanent part of the regulation schedule.

e. Raise the Mississippi River flood constraints from 17 feet to 18.5 feet at Burlington, Iowa, and from 18.0 feet to 20.0 feet at Quincy, Illinois.

These 1984 recommended changes to the regulation plan result in only very minor changes in the long-term project conditions. Plates A-1 through A-6 compare impacts of the present plan (developed in 1968) and the modified plan (developed in 1984) regulation schedules on elevation-frequency and elevation-duration relationships for the pool and downstream stations. This study was based on the period of record 1921-1984 and a conservation pool level at elevation 728 feet NGVD.

Five alternatives (Plans 1, 2, 3, 4 and 7) to raising the Lake Red Rock conservation pool, as described in the main report, were studied in detail. The plans, which include the recommended changes a. through e. above, are evaluated in this study. All plans use the same recommended regulation schedule, and differ only in the conservation pool elevations. A detailed regulation schedule is shown in table A-1.

TABLE A-1

Flood Control Regulation Schedule

Regulation Schedule	Reservoir Stage	Condition	Operation
A. Normal flood control operation	Rising	I. December 16 thru April 30	Maintain permanent pool level by releasing inflow up to 22,000 ft^3/s, then permit pool level to rise with uncontrolled outlet discharge until elevation 750 is reached (corresponds to uncontrolled outlet discharge of 30,000 ft^3/s, then continue to release 30,000 ft^3/s as pool continues to rise, except as limited by Condition A-II, and Schedule B.
	Rising	II. December 16 thru April 30. Stage at Ottumwa or Keosauqua above or forecast to exceed 10.8 or 20.8 feet, respectively.	Release not less than 5,000 ft^3/s to control flow to those discharges at respective stations insofar as possible, except as limited by Schedule B.
	Falling steady or rising	III. May 1 thru December 15. Reservoir at or above permanent pool elevation but lower than elevation 755.	Release 18,000 ft^3/s until reservoir recedes to permanent pool level, after which it shall be held at that level insofar as possible without exceeding release of 18,000 ft^3/s (22,000 -f pool above 760), except as limited by Condition A-IV, and Schedule B.
	Rising	IV. May 1 thru December 15. Stage at Ottumwa or Keosauqua above or forecast to exceed 7.6 feet (8.7 if pool higher than 760) or 17.5 feet (18.4 if pool higher than 760, respectively, including release in Condition A-III).	Release not less than 5,000 ft^3/s to control flow to those discharges at respective stations insofar as possible, except as limited by Schedule B.

TABLE A-1 (Cont'd)

Regulation Schedule	Reservoir Stage	Condition	Operation
		V. Any date, stage at, above or forecast to exceed 18.5 feet on Mississippi River gage at Burlington, Iowa, or 20.0 feet on Mississippi River gage at Quincy, Illinois.	During period corresponding to time Mississippi River is above forecast stages provided reservoir inflow is greater than 5,000 ft^3/s, release not less than 5,000 ft^3/s until reservoir elevation 757.0 is reached; then, provided (a) reservoir inflow is greater than 15,000 ft^3/s, release not less than 15,000 ft^3/s until reservoir elevation 765.0 is reached or (b) if reservoir inflow is between 5,000 ft^3/s and 15,000 ft^3/s release the inflow; then, if operation (a) was followed and at elevation 765.0, provided (c) reservoir inflow is greater than 25,000 ft^3/s until reservoir elevation 775 is reached, or (d) if reservoir inflow is between 15,000 ft^3/s and 25,000 ft^3/s, release the inflow; then if operation (c) was followed release not less than 30,000 ft^3/s, except as limited by Schedule B.
B. Large magnitude flood operation	Rising Falling	I. Any date reservoir elevation is above or forecast to exceed elevation 775.	When predictions indicate that anticipated runoff from a storm will appreciably exceed the storage capacity remaining in the reservoir when operated under Schedule A, release rates will be made in accordance with the following schedule:

TABLE A-1 (Cont'd)

Regulation Schedule	Reservoir Stage	Condition	Operation	
			Pool Elev.	Outflow (ft^3/s)
			775	30,000
			776	35,000
			777	40,000
			778	45,000
			779	50,000
			780	60,000
			780.5	80,000
			781	100,000
			781.5	115,000
			782	130,000
			783	130,000
			784	130,000
			785	130,000
			785	Open spillway tainter gates as necessary to maintain reservoir elevation 785 until uncontrolled spillway and outlet conduit discharge prevails, then allow reservoir to continue rising with uncontrolled spillway and o tlet conduit discharge
C. Drought regulation for water quality	Any date reservoir is below elevation 734.0 feet NGVD	Pool above elevation 727.0	Release 300 ft^3/s	
		Pool between elevations 726 and 727	Release 290 ft^3/s	
		Pool between elevations 725 and 726	Release 275 ft^3/s	

TABLE A-1 (Cont'd)

Regulation Schedule	Reservoir Stage	Condition	Operation
		Pool between elevations 724 and 725	Release 250 ft^3/s
		Pool between elevations 723 and 724	Release 225 ft^3/s
		Pool between elevations 722 and 723	Release 200 ft^3/s
		Pool between elevations 718 and 722	Release 175 ft^3/s
		Pool between elevations 713 and 718	Release 150 ft^3/s
		Pool below elevation 713 feet.	Release 100 ft^3/s
D. Flash flood emergency		Any date Cedar Creek at Bussey is at or forecast to be 18,000 ft^3/s or higher.	Release 500 ft^3/s until peak passes.

SEDIMENTATION AND SAYRED

SAYRED uses a constant elevation-area-capacity relationship throughout each run to model the operation of Lake Red Rock and Saylorville Lake. During the course of the study, consideration was given to updating the elevation-area-capacity tables at various intervals with data from "SEDRES" (the sediment model used in this study, appendix C) to more accurately model the actual operation of Saylorville Lake and Lake Red Rock. To determine the benefit of updating the elevation-area-capacity tables, Plan 2 (742 conservation pool) was modeled with a 1984 capacity table and a 2084 projected capacity table from SEDRES. Plate A-7 indicates a minor impact on the pool elevation-frequency relationship. The downstream (Ottumwa and Keosauqua) frequency curves as shown on plates A-8 and A-9 did not change for the two conditions. Therefore, the 1984 elevation-area-capacity tables were used in all SAYRED runs in this study.

RESULTS

Plates A-7, A-8, and A-9 indicate that for the conditions and time period (1921-1984) used in this study, the accumulation of sediment did not significantly affect the pool level or downstream flow-frequency relationships.

Results of the study also indicate that the five alternative plans, each involving different conservation pool levels, have no impacts on the downstream flow-frequency relationships and only minor impacts on the pool level frequency relationships. Plates A-8 and A-9 present the downstream flow-frequency relationships for Ottumwa and Keosauqua for all five plans. Although all plans result in the same discharge-frequency relationships, small differences in downstream flows may result for given flood events if a period is considered during which the conservation pools are different. Plate A-10 shows the pool level frequency curves for the five plans and the No Action alternative. Plan 1 results in a lower probability for any given pool elevation compared to the other alternatives. However, plate A-10 indicates that for elevations above about 750 feet NGVD or probabilities less than approximately 30 percent (a recurrence interval of about every 3.3 years), Plans 1, 2, 3, 4, and 7 have very nearly the same pool frequency relationship.

Plate A-11 shows the duration that the pool is expected to be at or above any given elevation based on the period of record (1921-1984) studied. All five plans result in elevation 750 feet NGVD being equalled or exceeded about 6 percent of the time and have the same duration-elevation relationship above this elevation. The No Action plan also is shown for comparison. The plans maintain a high enough pool to provide storage for low-flow augmentation. This is, in part, due to the significant contribution to low-flow augmentation provided by the Saylorville project and the maintenance of a minimum conservation storage of 50,000 acre-feet. A comparison of the flow duration relationships at Ottumwa and Keosauqua for each of the alternatives indicated no variation from the 1984 regulation curves shown on plates A-5 and A-6.

FINDINGS

Plan 1 results in slightly lower pool elevation frequency conditions. This is due to the longer time period before the conservation pool is maintained at elevation 742 feet NGVD and, therefore, during this period more storage is available. For this reason, Plan 1 is the most desirable from a flood control perspective. Plans 2, 3, 4, and 7 all result in approximately the same conditions and are not significantly different from Plan 1. All five plans meet the objectives of the study from a regulation standpoint.

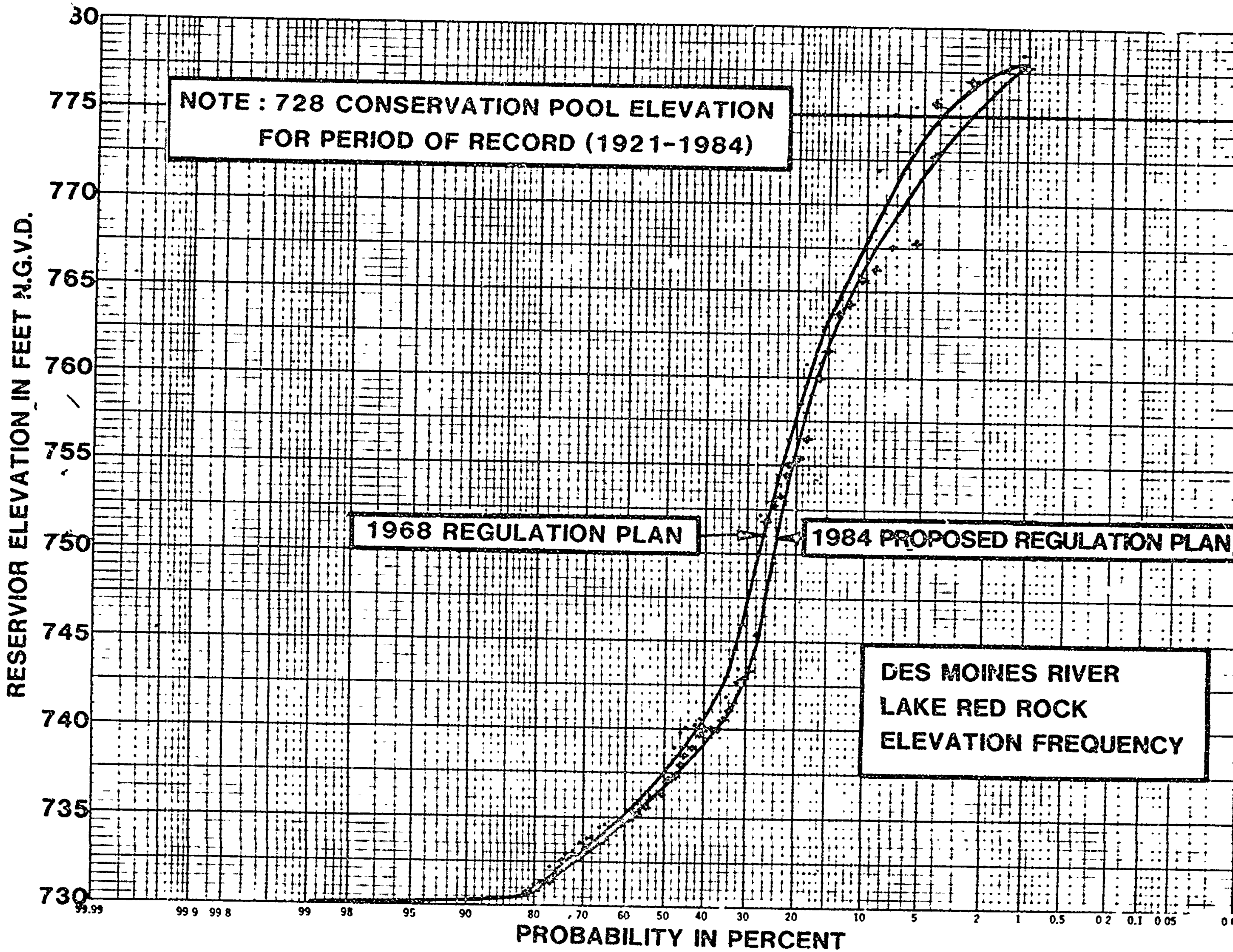

NOTE : 728 CONSERVATION POOL ELEVATION
FOR PERIOD OF RECORD (1921-1984)
1968 REGULATION PLAN
1984 PROPOSED REGULATION PLAN
DES MOINES RIVER
LAKE RED ROCK
ELEVATION FREQUENCY
RESERVIOR ELEVATION IN FEET N.G.V.D.
PROBABILITY IN PERCENT

PLATE A-1

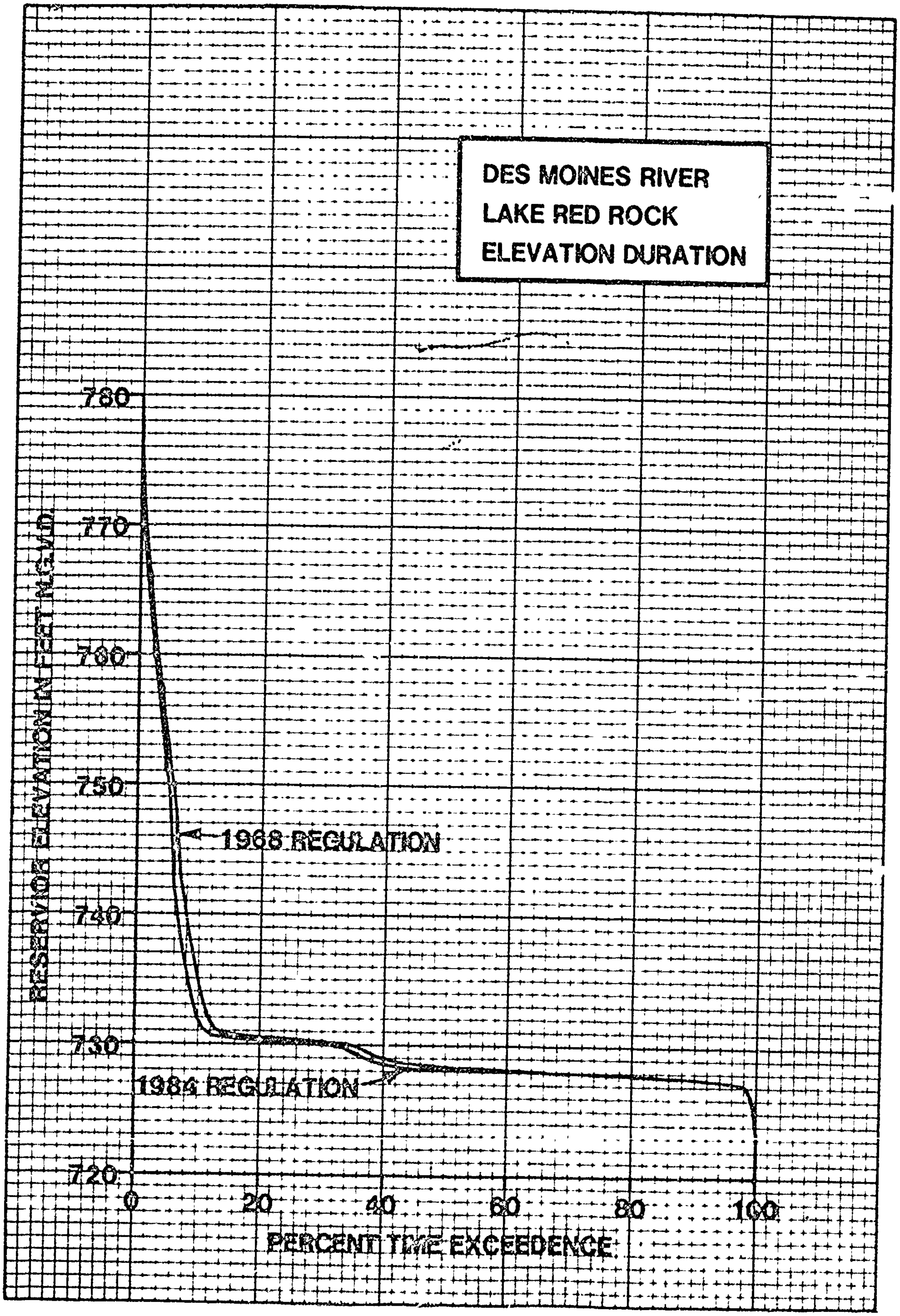
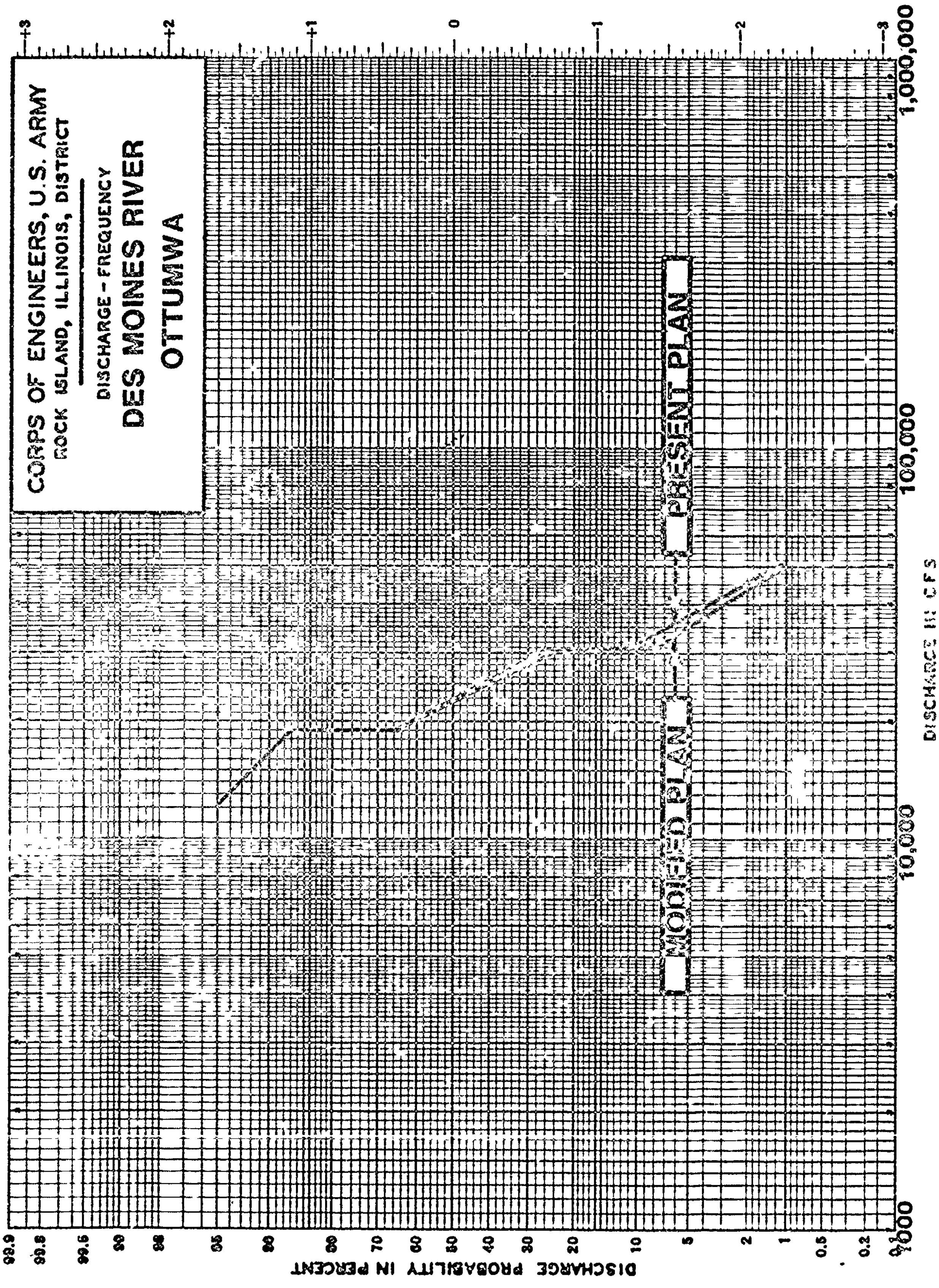

DES MOINES RIVER
LAKE RED ROCK
ELEVATION DURATION
RESERVIOR ELEVATION IN FEET M.G.V.D
780
770
760
750
740
730
720
1968 REGULATION
1984 REGULATION
0
20
40
60
80
100
PERCENT TIME EXCEEDENCE

PLATE A-2


CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
DES MOINES RIVER
OTTUMWA
PRESENT PLAN
MODIFIED PLAN
DISCHARGE IN C F S
DISCHARGE PROBABILITY IN PERCENT
1000
10,000
100,000
1,000,000
99.9
99.8
99.6
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
+3
+2
+1
0
-1
-2
-3

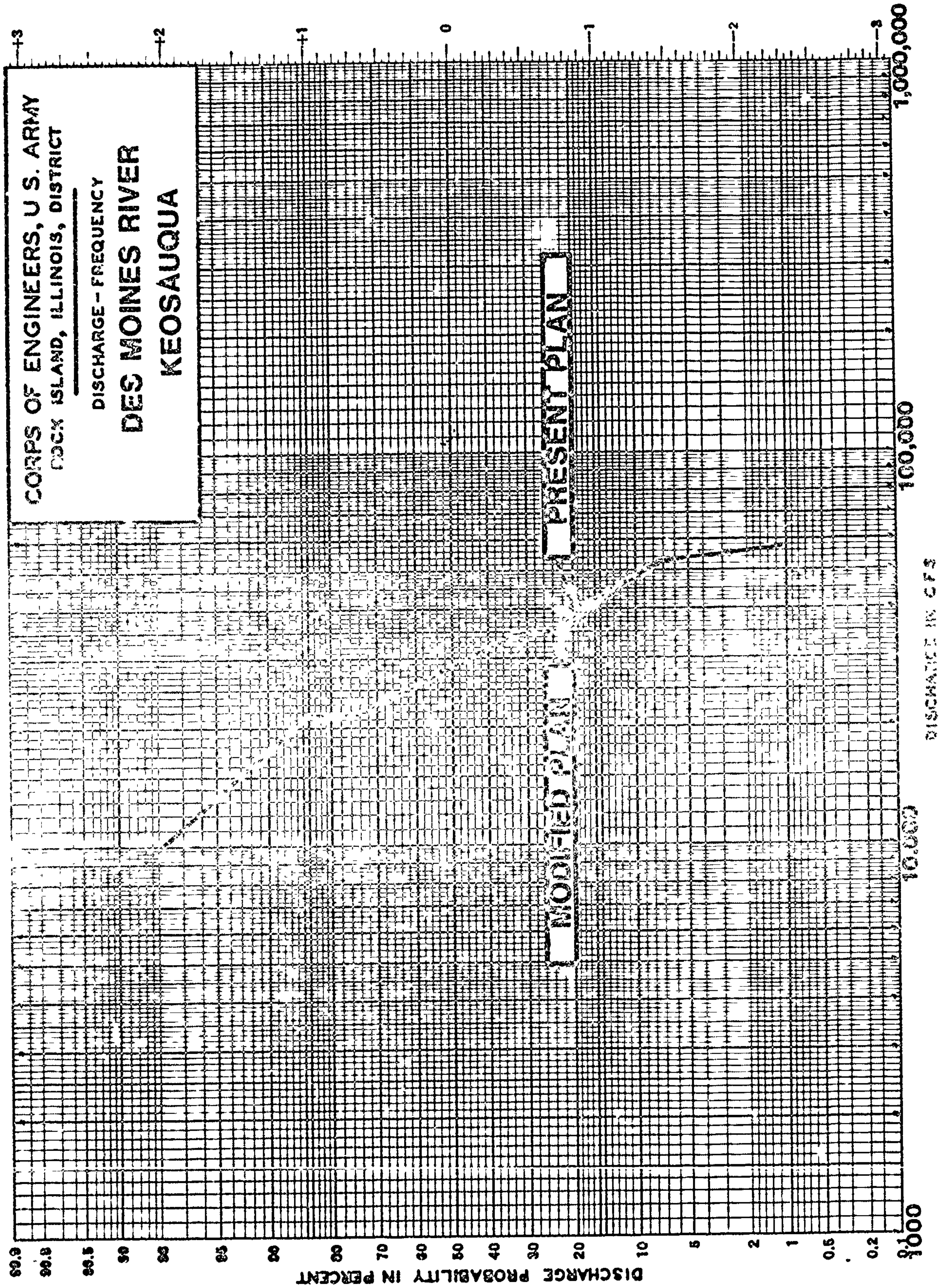

CORPS OF ENGINEERS, U S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
DES MOINES RIVER
KEOSAUQUA
PRESENT PLAN
MODIFIED PLAN
DISCHARGE IN CFS
DISCHARGE PROBABILITY IN PERCENT
1000
10,000
100,000
1,000,000

PLATE A-4

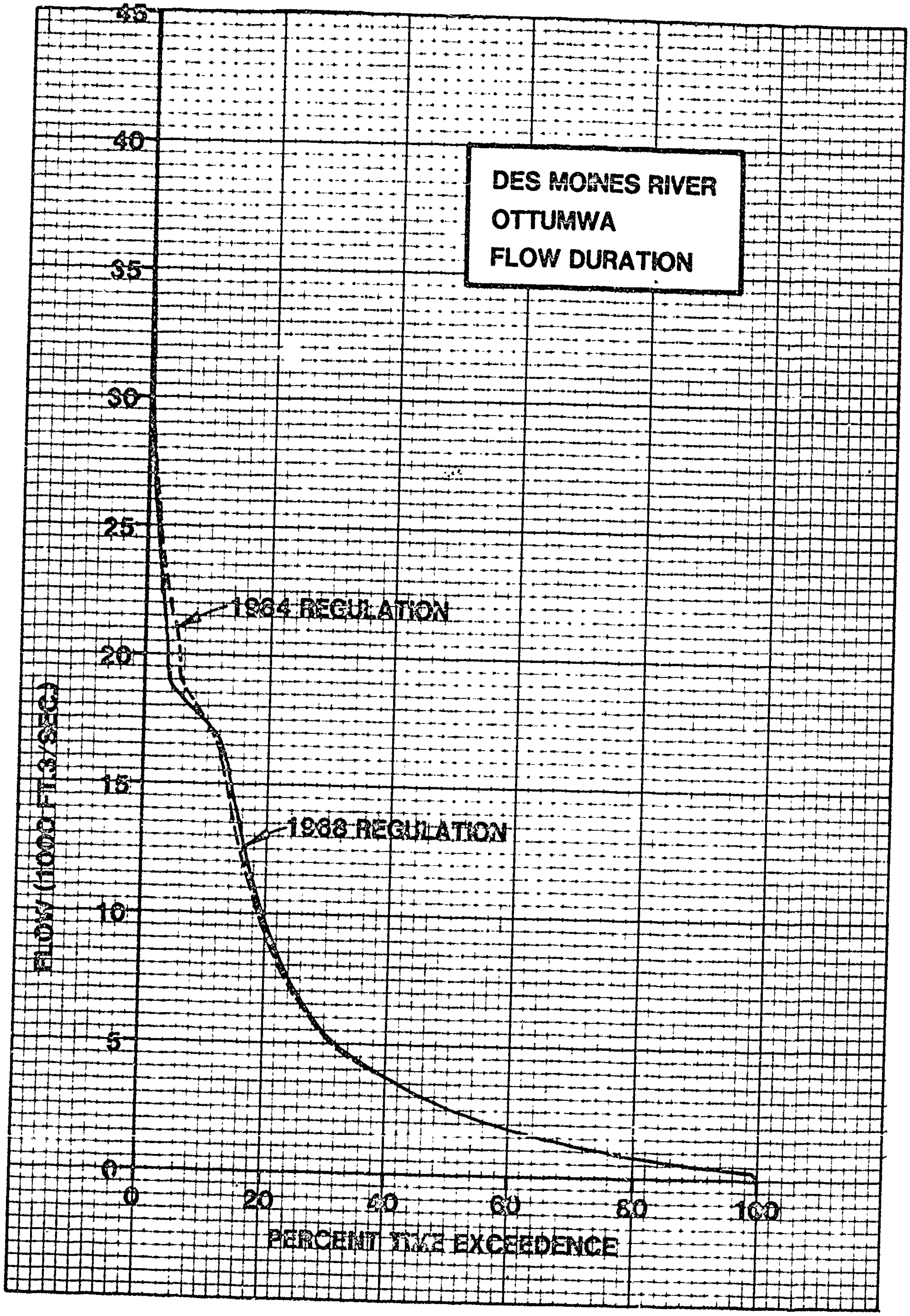

DES MOINES RIVER
OTTUMWA
FLOW DURATION
1964 REGULATION
1988 REGULATION
FLOW (1000 FT3/SEC)
PERCENT TIME EXCEEDENCE
0
5
10
15
20
25
30
35
40
45
0
20
40
60
80
100

PLATE A-5

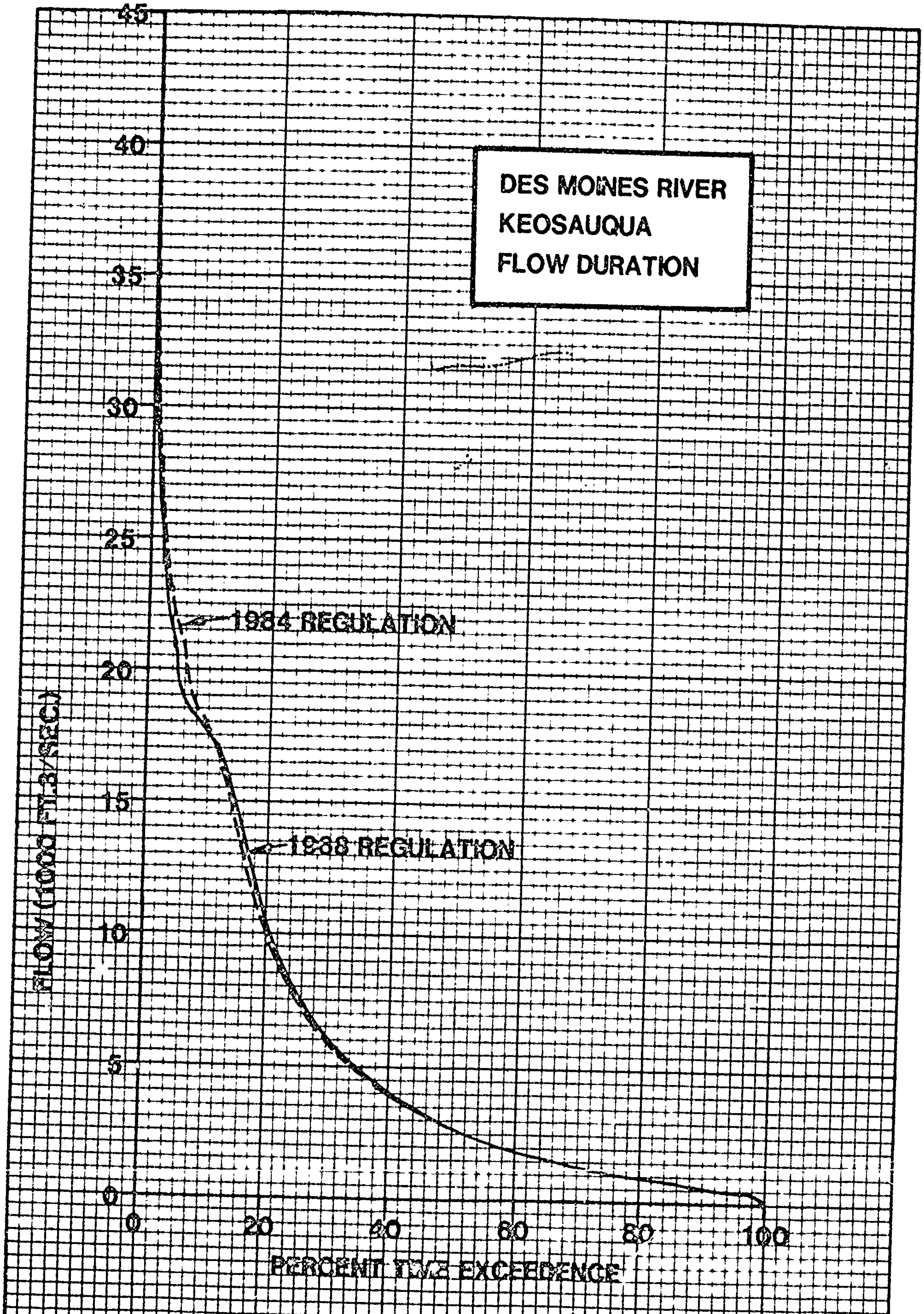

DES MOINES RIVER
KEOSAUQUA
FLOW DURATION
1984 REGULATION
1938 REGULATION
FLOW (1000 FT.3/SEC.)
PERCENT TIME EXCEEDENCE
0
5
10
15
20
25
30
35
40
45
0
20
40
60
80
100

PLATE A-6

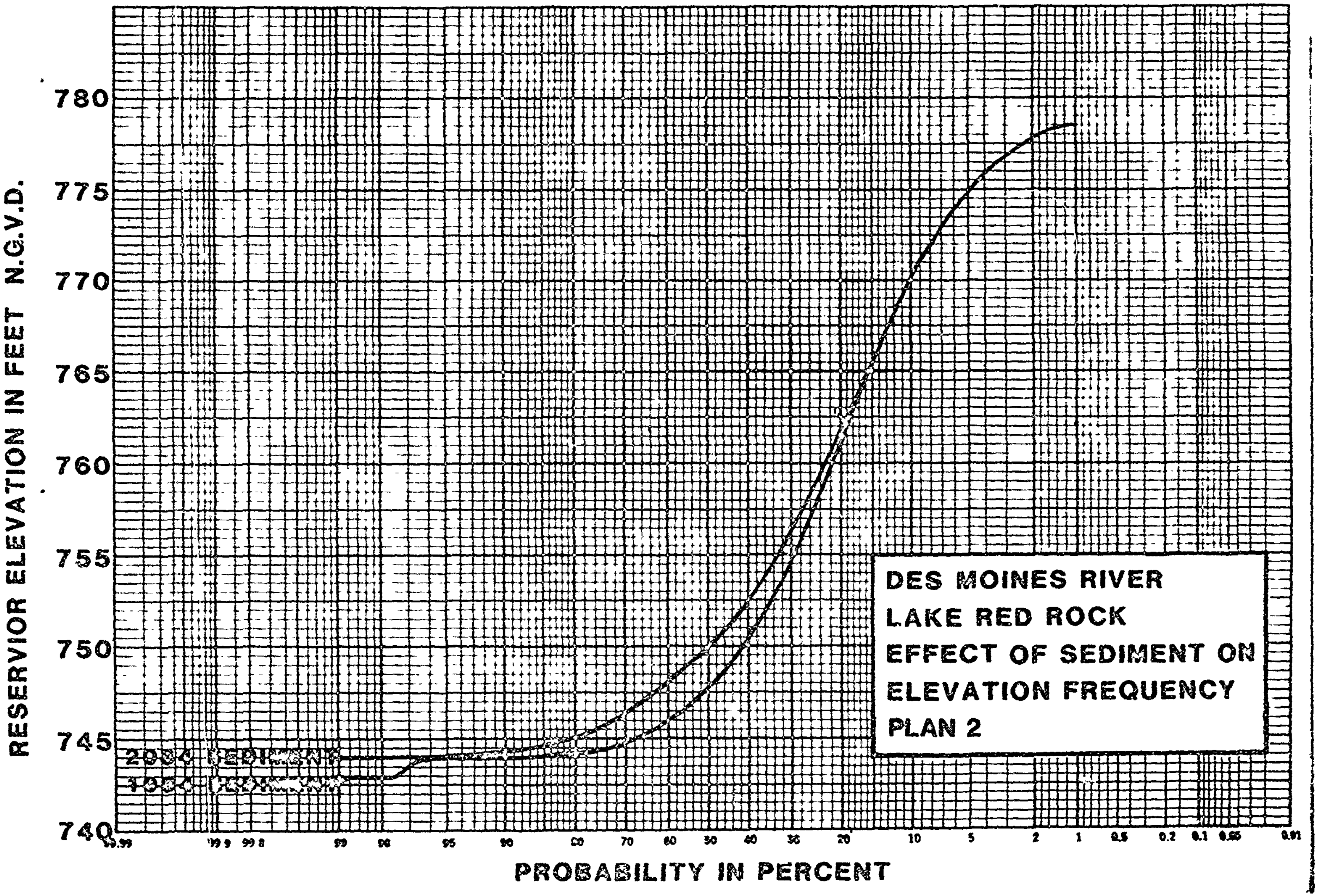

DES MOINES RIVER
LAKE RED ROCK
EFFECT OF SEDIMENT ON
ELEVATION FREQUENCY
PLAN 2
RESERVIOR ELEVATION IN FEET N.G.V.D.
780
775
770
765
760
755
750
745
740
PROBABILITY IN PERCENT

PLATE A-7

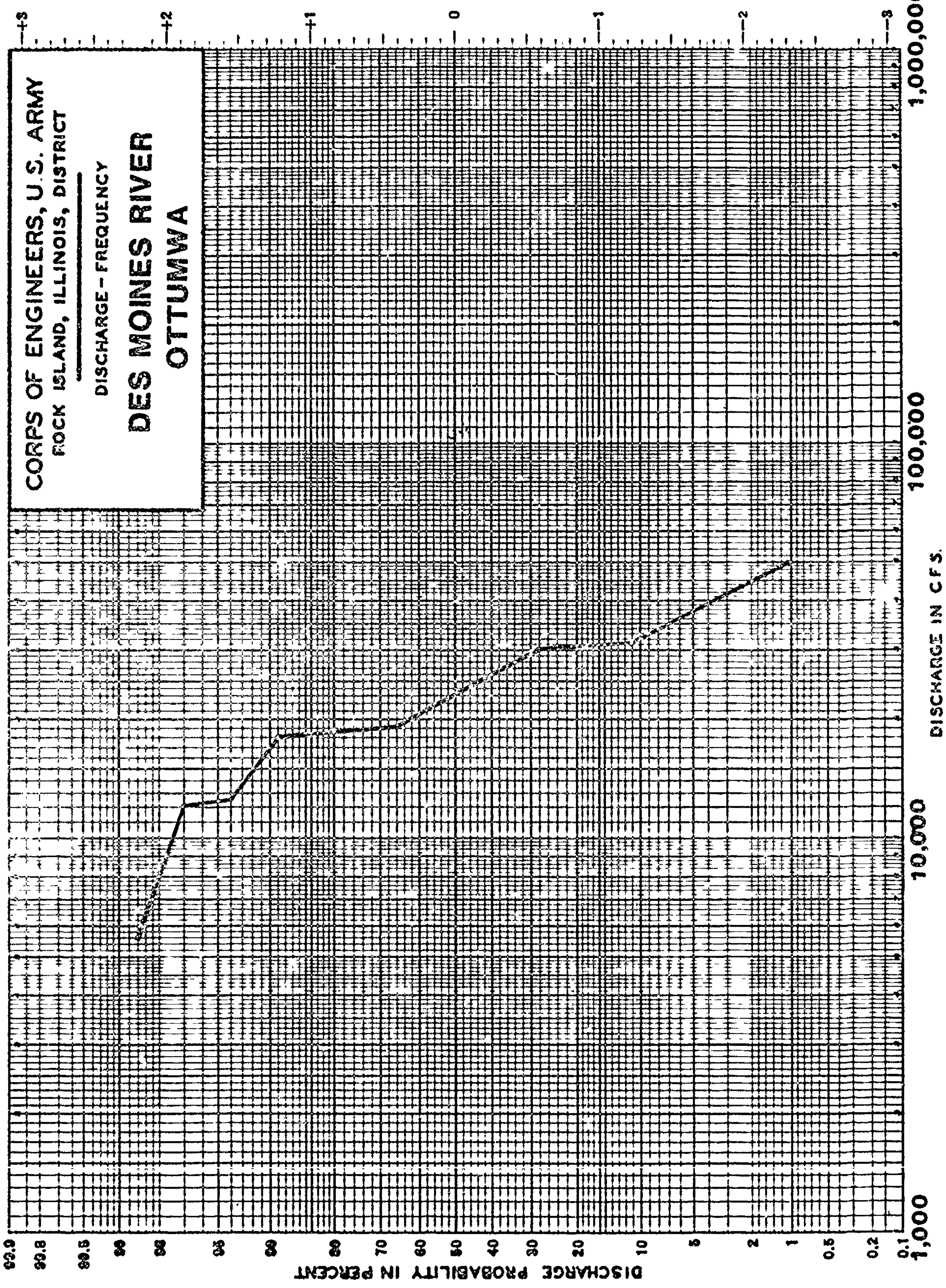

CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE-FREQUENCY
DES MOINES RIVER
OTTUMWA
DISCHARGE IN C F S
1,000
10,000
100,000
1,000,000
DISCHARGE PROBABILITY IN PERCENT
99.9
99.8
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
+3
+2
+1
0
-1
-2
-3

PLATE A-8

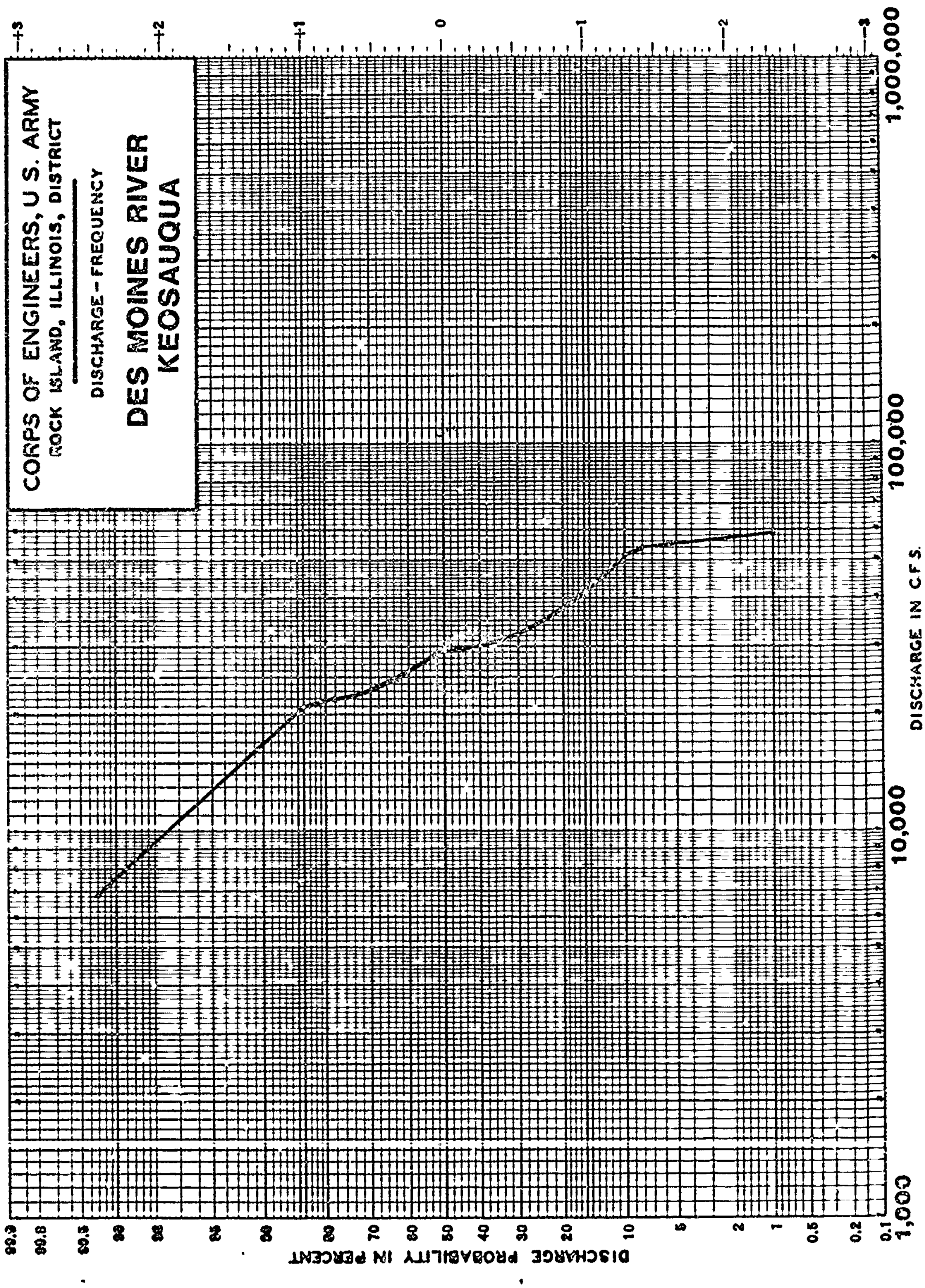

CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
DES MOINES RIVER
KEOSAUQUA
DISCHARGE IN C.F.S.
DISCHARGE PROBABILITY IN PERCENT
1,000
10,000
100,000
1,000,000

PLATE A-9

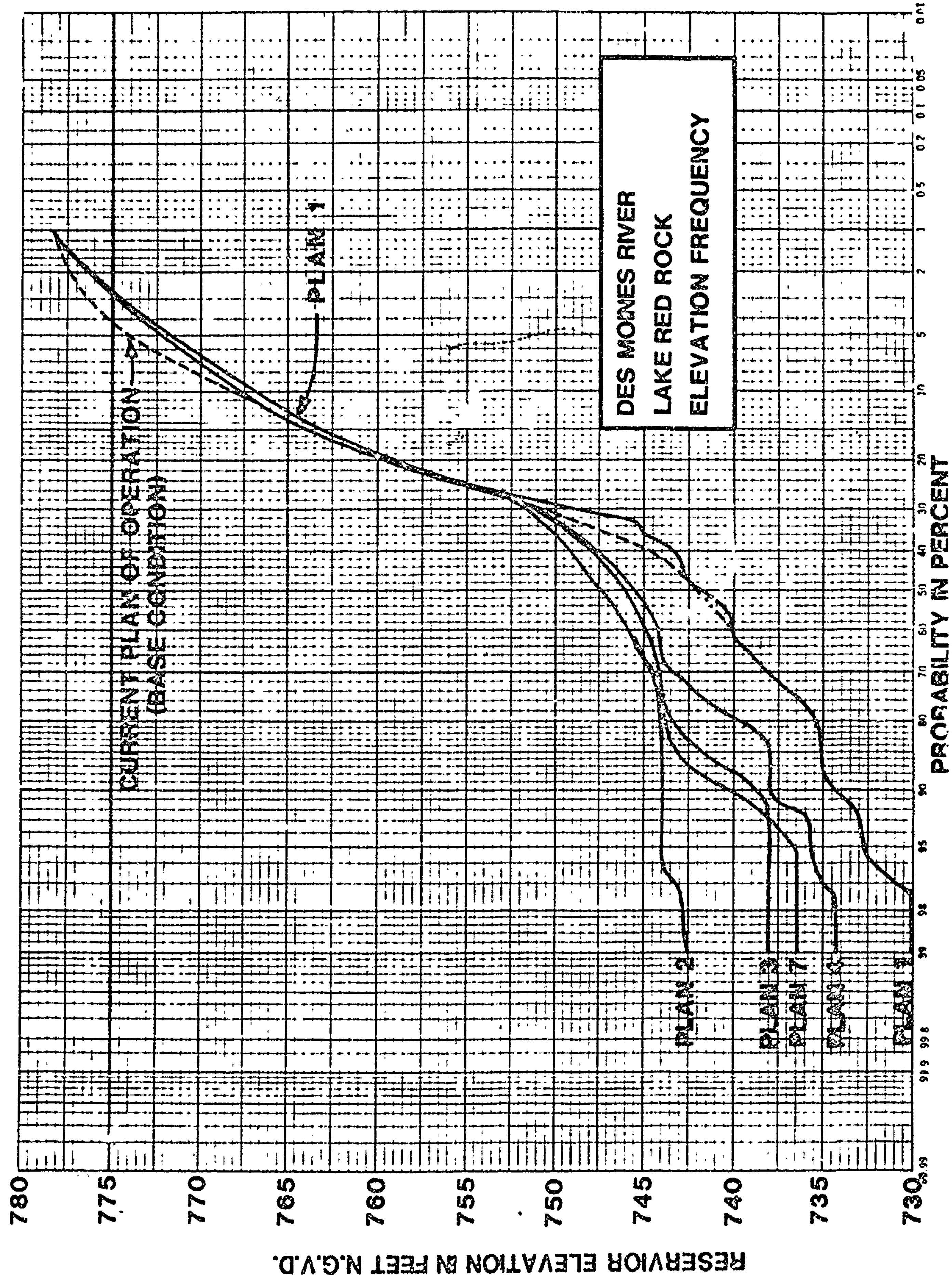

DES MOINES RIVER
LAKE RED ROCK
ELEVATION FREQUENCY
CURRENT PLAN OF OPERATION
(BASE CONDITION)
PLAN 1
PLAN 2
PLAN 3
PLAN 7
PLAN 4
PLAN 5
PROBABILITY IN PERCENT
RESERVIOR ELEVATION IN FEET N.G.V.D.
780
775
770
765
760
755
750
745
740
735
730

PLATE A-10

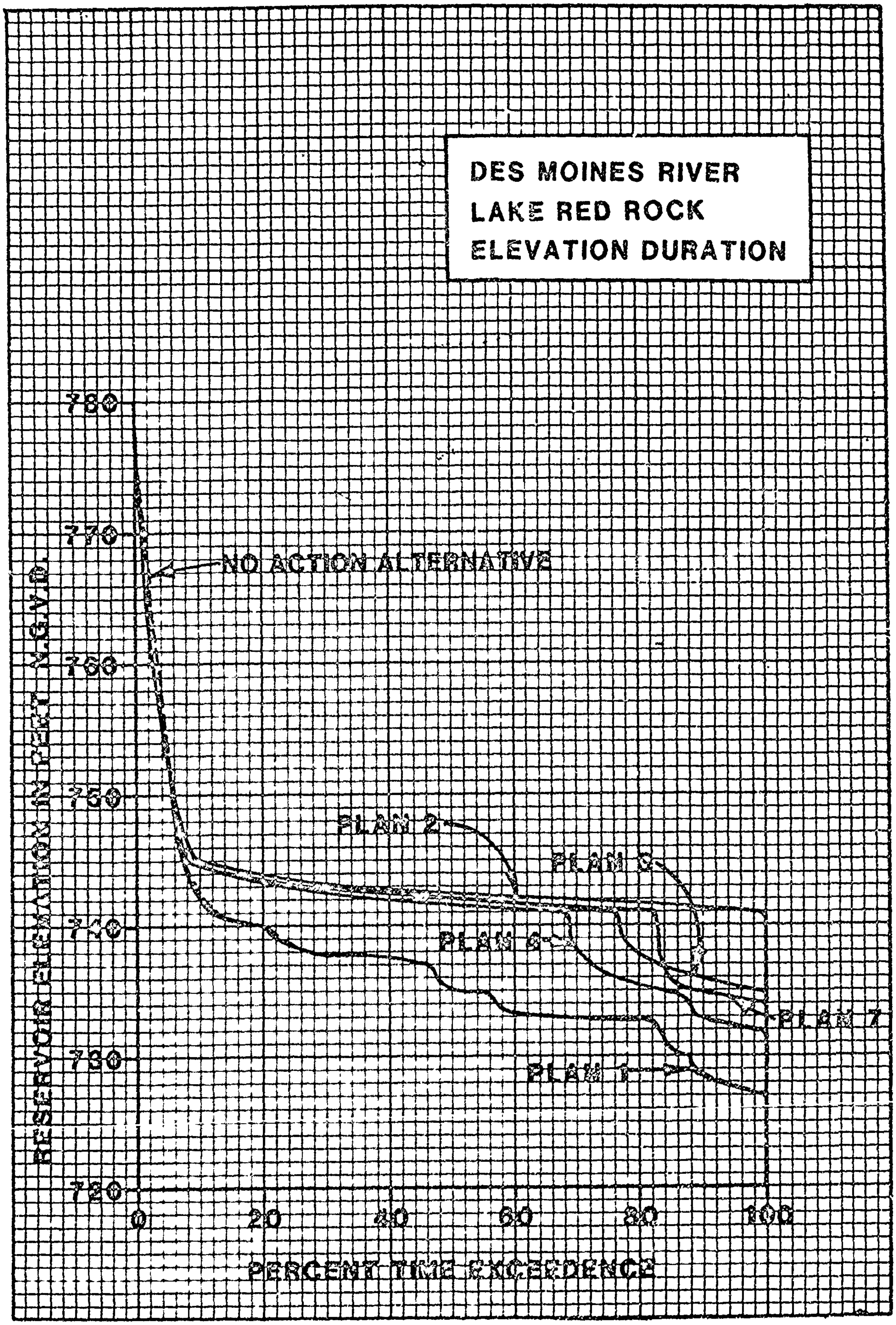

DES MOINES RIVER
LAKE RED ROCK
ELEVATION DURATION
780
770
760
750
740
730
720
0
20
40
60
80
100
NO ACTION ALTERNATIVE
PLAN 2
PLAN 6
PLAN 4
PLAN 7
PLAN 1
RESERVOIR ELEVATION IN FEET N.G.V.D.
PERCENT TIME EXCEEDENCE

PLATE A-11

APPENDIX B

WATER QUALITY EVALUATION

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX B
WATER QUALITY EVALUATION

TABLE OF CONTENTS

List of Tables

List of Plates

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX B
WATER QUALITY EVALUATION

OVERVIEW

The Red Rock Reservoir currently exhibits intermittent, weak thermal stratification, periods of low dissolved oxygen concentrations near the bottom, and little phytoplankton growth within the pool itself. Downstream, water quality is quite acceptable and water temperatures are very close to those observed near the bottom of the reservoir.

Results of the CE-THERM-R1 model indicate that thermal stratification will be more pronounced both in terms of its intensity and duration as the normal pool is raised. However, the reservoir will continue to mix when sufficient external energy, from either wind or advective flow, is present. Thus, no permanent, well-defined stratification will develop. As a result, water temperatures downstream probably will decrease by only 4 to 5 degrees centigrade (°C). Periods of low dissolved oxygen near the bottom of the reservoir will continue and, in fact, may increase, but probably will dissipate when the reservoir is mixed.

The most obvious change is likely to be a significant increase in the amount of phytoplankton which develops during the warm summer months. Because concentrations of algae in surface waters can prove to be a nuisance to recreation, there may be periods when swimming and boating will be impacted. In the past, phytoplankton "blooms" have been controlled by the subsequent development of zooplankton populations which graze on the algae. It is probable that this situation will continue to occur. Thus, algal blooms probably will be of limited duration. Under these conditions, it is not anticipated that dissolved oxygen concentrations or fisheries will suffer to any detectable extent, and water quality in general should be adequate for all intended purposes.

GENERAL

Several possible water quality impacts, including algal blooms, dissolved oxygen depletion, fish kills, and changes in downstream water temperature, must be addressed in evaluating the alternative pool raises being considered. In order to evaluate the magnitude of these impacts, the mathematical model CE-THERM-R1 was used to predict in-pool water temperatures and any increase in the severity of thermal stratification.

Red Rock Reservoir is a shallow, eutrophic reservoir which usually exhibits weak, intermittent, thermal stratification. Any stratification which does develop is disrupted by wind action or advective flow within

4 or 5 weeks. Because of the abundance of highly erodible agricultural land within the basin, the reservoir water also is frequently very turbid. This, in combination with relatively short retention times, limits the growth of phytoplankton, and concentrations of algae in the pool are normally very low and constitute no threat to water quality. Dissolved oxygen concentrations throughout the majority of the water column are quite adequate to support aquatic life. During periods of stratification, however, low dissolved oxygen concentrations are observed (plate B-1), especially near the bottom of the reservoir. Since water is usually released through sluice gates located near the bottom of the reservoir, downstream water temperatures can be predicted quite accurately from in-pool bottom temperatures.

CE-THERM-R1 COMPUTER MODEL

CE-THERM-R1 is a one dimensional thermal model developed by the U.S. Army Waterways Experiment Station. An assumption, intrinsic to the model, is that a reservoir can be represented by a vertical series of homogeneous horizontal layers. Additionally, the one dimensional assumption limits the model in that no predictions are made in regard to longitudinal or lateral variations in water temperature. Model predictions are most representative of actual conditions in the deepest part of the reservoir, near the dam.

Data requirements for CE-THERM-R1 include daily inflow values, discharge, water temperature, suspended solids, and dissolved solids. In addition, meteorological data requirements include dry bulb and dew point air temperatures, wind velocity, barometric pressure, and percent of cloud cover. Daily discharge information is routinely determined by Rock Island District, Corps of Engineers, personnel. Water temperature observations are determined once a week by Iowa State University. Daily water temperatures were determined from air temperatures using a multiple linear regression technique described by Drummond and Robey (1975) 1/ (plate B-2). In-flow values for suspended solids and dissolved solids concentrations were determined from daily observed suspended solids concentrations at stations located on all of the major tributaries to Lake Red Rock. Meteorological data were obtained from the National Weather Service stations located in Des Moines and Knoxville, Iowa.

1/ Drummond, G. R. and D. L. Robey, 1975. Natural Stream Temperature Analysis, Allegheny River Near Kinzua, Pennsylvania. Special Report No. 8, U.S. Army Engineer Division, Ohio River, Cincinnati.

MODEL CALIBRATION

Model calibration was accomplished by comparing observed surface water elevations and in-pool water temperatures with values predicted by the model. Observed data collected during calendar year 1980 were selected for calibration purposes because 1980 hydrologic conditions were typical for the Des Moines River and Red Rock Reservoir. Values of modeling coefficients were selected from a range of empirical values found in the literature. Values which are properly selected should be valid for a wide range of hydrologic conditions.

After making a number of calibration runs, predicted water temperature profiles were optimally matched with observed profiles for 1980. Reliability of the results was determined by a statistical analysis program provided as a utility to the main program. Predicted temperature profiles also were compared graphically to observed profiles. As further verification that the coefficients chosen were truly representative, coefficients chosen for the 1980 simulation were used in the model along with data from 1979, a high flow year. Observed water temperature values were compared to predicted values. The observed and predicted values for both years were within the range considered acceptable as determined by the model developers. Having successfully simulated water temperatures for 1 year of low to average flows and another of high flows, it was determined that modeling coefficients were properly selected and that the model is a valid predictor of water temperatures for most hydrologic conditions experienced in the lower Des Moines River basin.

Pool raise simulations were then run for both 1979 and 1980. These simulations were accomplished by changing initial input pool elevations to reflect the pool raise.

RESULTS

Following model calibration and verification, a simulation run was made using 1980 hydrologic data. Results of the simulation are presented in plates B-3 through B-10. It can be seen that the simulated water temperature data using elevation 728 feet NGVD (National Geodetic Vertical Datum) agree quite well with the observed data. The only exceptions were noted on June 9 and 16, 1980. During these 2 weeks, major hydrologic events occurred for which no verification data were available; thus, the model did not accurately predict water temperatures during that time. Table B-1 shows the observed and predicted surface and bottom water temperatures for the lake during the summer of 1980. With the exception of the first 2 weeks in June, the predicted temperatures are within 2.5°C of the observed. From plate B-2 it can be seen that differences in water temperature between the surface and bottom increase when an initial pool level of 742 feet NGVD is used. This is especially true during the latter part of June and most of July.

TABLE B-1

Observed and Predicted Water Temperatures (°C), 1980

Date	Observed Surface	Observed Bottom	Predicted 728 NGVD Surface	Predicted 728 NGVD Bottom	Predicted 742 NGVD Surface	Predicted 742 NGVD Bottom
Mar 31	5.5	5.5	5.6	5.4	5.2	4.9
Apr 9	9.4	9.0	9.1	9.0	8.6	8.3
Apr 14	6.4	6.4	6.7	6.7	7.0	7.0
Apr 21	16.5	9.1	16.5	11.7	16.0	8.2
Apr 28	16.0	15.5	15.7	13.4	14.9	14.1
May 5	19.3	15.8	19.7	16.2	19.5	14.7
May 12	14.9	14.4	15.4	15.2	15.4	15.4
May 20	17.7	15.4	16.2	14.7	16.2	14.7
May 27	20.5	14.0	22.9	15.6	22.6	14.8
Jun 2	-	-	-	-	-	-
Jun 9	15.4	15.3	23.5	21.5	22.6	23.5
Jun 16	29.5	28.0	23.4	24.0	23.0	23.5
Jun 23	21.1	-	23.6	21.6	23.2	22.2
Jun 30	25.2	20.0	26.5	24.4	26.3	22.8
Jul 7	27.9	24.8	28.3	26.1	28.0	24.7
Jul 14	29.3	27.6	29.6	27.3	29.4	25.7
Jul 21	27.7	27.4	27.7	27.7	27.5	26.2
Jul 28	25.9	25.3	25.9	25.7	25.9	24.1
Aug 4	25.6	25.4	26.1	26.1	26.1	24.7
Aug 11	27.6	26.4	26.8	26.8	26.6	25.7
Aug 18	24.8	23.8	25.0	23.8	25.0	23.4
Aug 25	25.4	24.8	25.2	25.1	24.9	24.6
Sep 2	26.0	24.8	24.3	24.3	24.4	24.4
Sep 8	25.5	25.1	25.8	24.6	25.6	24.3
Sep 15	22.3	22.1	21.0	21.0	21.3	21.3
Sep 22	20.4	20.0	19.8	19.8	19.8	18.7
Sep 29	18.8	18.1	16.2	15.7	16.4	15.7

Table B-2 shows that during this same period observed dissolved oxygen (D.O.) concentrations near the bottom of the reservoir were quite low for several consecutive weeks. It can be seen that when D.O. concentrations were the lowest, the differences in water temperatures between the surface and bottom were greatest. It also can be seen that when the simulation is run using 742 feet NGVD as the initial elevation, the duration of significant temperature differences between surface and bottom increases.

Another predicted result of the pool raise is an increase in the depth to which short wave solar radiation penetrates the water column. Table B-3 shows that during the period when stratification is the most pronounced, short wave solar radiation penetrates 0.5 to 1.8 meters further at elevation 742 feet NGVD as compared to 728 feet NGVD.

TABLE B-2

1980 Observed and Simulated Temperature Change with Reservoir Depth During Critical Dissolved Oxygen Period

Date	Observed Data (728 NGVD)		Simulated Data (742 NGVD)
	D.O. Concentration Near the Bottom (mg/l)	Difference Between Surface and Bottom Temp (C°)	Difference Between Surface and Bottom Temp (C°)
Jun 9	6.3	1.5	3.1
Jun 16	6.0	-0.6	-0.6
Jun 23	2.9	1.3	1.2
Jun 30	1.9	1.6	4.0
Jul 7	2.1	2.1	5.1
Jul 14	2.1	2.3	6.0
Jul 21	5.7	0.0	3.6
Jul 28	3.1	2.0	1.7
Aug .	-	0.0	1.5
Aug 11	5.8	0.0	1.7
Aug 18	4.8	1.2	1.3
Aug 25	3.0	0.1	0.5
Sep 2	3.6	0.0	0.0
Sep 8	5.7	1.1	1.1
Sep 15	6.2	0.0	0.0

TABLE B-3

Secchi Disk Depth and Depth to Which 90 Percent of Incident Solar Radiation Penetrates, 1980

Date	Observed Secchi Disk Depth (m)	Predicted w/o Pool Raise (m)	Predicted w/ Pool Raise (m)
Mar 31	0.7	0.9	1.2
Apr 9	0.4	0.1	0.8
Apr 14	0.5	0.7	0.1
Apr 21	0.7	0.1	0.8
Apr 28	0.5	0.9	1.2
May 5	0.8	1.0	1.1
May 12	0.7	1.3	1.7
May 20	0.8	1.5	1.3
May 27	1.1	1.3	1.5
Jun 9	-	0.1	0.6
Jun 16	0.4	0.1	0.1
Jun 23	0.5	1.2	0.1
Jun 30	0.6	0.9	1.3
Jul 7	0.4	1.2	1.6
Jul 14	0.4	1.1	1.0
Jul 21	0.5	1.5	1.6
Jul 28	0.5	1.3	1.2
Aug 4	0.5	1.4	1.6
Aug 11	0.7	1.2	1.3
Aug 18	0.5	1.4	1.4
Aug 25	0.4	1.0	0.8
Sep 2	0.5	1.1	1.3
Sep 8	0.6	1.2	0.9
Sep 15	0.5	1.2	1.1
Sep 22	0.5	1.0	1.3
Sep 29	0.7	1.7	1.4
Average	0.6	1.02	1.09

In order to determine how the reservoir would react to a pool raise during a high flow year, a simulation run was made using 1979 hydrologic data. As a result of the high flows, the reservoir surface elevation was w ll above normal for most of the simulation period. Tabular summaries of the results are presented in tables B-4 through B-6. Trends similar to those observed for 1980 were seen in terms of the absolute magnitude and duration of thermal stratification and light penetration. In general, however, the reservoir was impacted to a lesser degree during 1979 as compared to 1980.

FINDINGS

From the comparisons of observed data when the conservation pool is maintained at elevation 728 feet NGVD and predicted data when the conservation pool is raised to elevation 742 feet NGVD, it is apparent that the higher reservoir elevation does adversely impact water quality. This is seen from the fact that not only does the difference between surface and bottom temperatures increase by approximately 2.0°C at the higher pool elevation (more pronounced thermal stratification), but the duration of stratification is also longer.

However, the increased intensity of stratification does not reach the point where it becomes physically stable and resistant to disruptive forces such as wind action and advective flow. This is evident from the fact that the reservoir tends to mix periodically throughout the simulation period. It also is apparent that the reservoir is more susceptible to stratification during periods of average to below average flow; thus, 1979, a high flow year, does not show the same degree of stratification as does 1980. This might lead one to believe that extremely low-flow periods would produce the most intense stratification. While there is some evidence for this, a review of 1977 water quality data (a drought year) reveals very little stratification and few weeks with observable water quality problems. Thus, there is no evidence that degradation of water quality due to a higher pool under extremely low-flow conditions would result in unacceptable conditions.

Because bottom water temperatures are very similar to temperatures observed downstream from the reservoir, it is likely that downstream water temperatures will decrease by approximately the same amount as bottom water temperatures. From plates B-4 through B-10 it can be seen that this may be as much as 5°C, but will average about 1.5°C.

TABLE B-4

Observed and Predicted Water Temperatures (°C), 1979

Date	Observed Surface	Observed Bottom	Predicted 728 NGVD Surface	Predicted 728 NGVD Bottom	Predicted 742 NGVD Surface	Predicted 742 NGVD Bottom
Apr 9	4.5	4.1	4.1	4.1	4.1	3.9
Apr 16	7.5	5.5	8.4	6.3	8.3	6.1
Apr 23	9.8	7.0	14.2	7.9	14.0	7.0
Apr 30	10.2	9.9	11.9	10.5	11.5	10.5
May 7	13.1	12.1	13.7	11.8	13.6	10.0
May 14	16.2	13.8	16.0	12.2	15.9	11.9
May 21	18.0	15.2	18.2	14.7	18.1	14.0
May 28	20.0	16.0	19.6	16.8	19.7	16.1
Jun 4	21.0	16.0	20.7	17.2	20.5	16.6
Jun 11	20.3	16.5	20.7	19.3	20.7	18.3
Jun 18	23.0	22.0	21.9	21.0	21.8	20.0
Jun 25	23.0	21.5	22.4	22.2	22.3	21.9
Jul 2	24.1	22.0	23.7	23.3	24.1	22.7
Jul 9	23.6	22.0	23.4	21.6	23.6	21.8
Jul 16	28.0	23.8	26.2	26.2	25.7	22.8
Jul 23	28.5	24.5	25.3	24.9	25.9	23.8
Jul 30	27.0	26.5	25.9	25.9	26.0	25.8
Aug 6	30.0	27.0	28.2	28.0	28.3	25.4
Aug 13	26.0	25.0	23.3	23.2	24.5	23.5
Aug 20	24.5	23.0	24.5	24.2	24.6	21.6
Aug 27	24.0	23.0	22.1	22.0	22.8	22.7
Sep 4	26.0	23.0	25.0	25.0	26.0	24.3
Sep 10	24.0	22.5	22.1	22.1	22.3	22.3
Sep 17	21.2	20.0	18.8	18.7	19.9	18.7
Oct 3	17.6	-	16.8	16.8	17.3	15.3

TABLE B-5

1979 Observed and Simulated Temperature Change with Reservoir Depth During Critical Dissolved Oxygen Period

Date	Observed Data (728 NGVD)		Simulated Data (742 NGVD)
	D.O. Concentration Near the Bottom (mg/1)	Difference Between Surface and Bottom Temp (C°)	Difference Between Surface and Bottom Temp (C°)
May 28	5.1	2.5	3.0
Jun 4	5.2	3.5	4.0
Jun 11	0.3	1.5	2.7
Jun 18	5.5	1.0	1.8
Jun 25	5.7	0.2	0.4
Jul 2	2.4	0.9	1.2
Jul 9	3.7	1.9	1.9
Jul 16	0.1	0.0	2.9
Jul 23	0.1	0.7	2.1
Jul 30	4.6	0.1	0.3
Aug 6	1.7	0.2	2.9
Aug 13	3.2	0.9	0.4
Aug 20	4.7	0.6	3.9
Aug 27	5.9	0.2	0.2
Sep 4	5.2	0.2	0.6
Sep 10	7.1	0.0	0.0

TABLE B-6

Secchi Disk Depth and Depth to Which 90 Percent of Incident Solar Radiation Penetrates, 1979

Date	Observed Secchi Disk Depth (m)	Predicted w/o Pool Raise (m)	Predicted w/ Pool Raise (m)
Apr 9	-	1.3	1.1
Apr 16	-	0.8	1.4
Apr 23	-	0.7	1.3
Apr 30	-	0.1	0.1
May 7	-	0.1	0.7
May 14	-	1.4	1.1
May 21	-	1.1	1.3
May 28	-	1.6	1.6
Jun 4	-	0.9	0.8
Jun 11	-	1.1	1.4
Jun 18	-	1.6	1.6
Jun 25	1.1	1.4	1.0
Jul 2	0.4	0.1	1.3
Jul 9	0.7	1.4	1.1
Jul 16	1.0	0.8	1.3
Jul 23	0.9	0.8	0.8
Jul 30	0.5	0.7	0.9
Aug 6	0.5	1.0	1.1
Aug 13	0.3	1.0	0.9
Aug 20	0.3	0.8	1.4
Aug 27	0.4	1.5	1.7
Sep 4	0.5	1.0	1.0
Sep 10	0.6	1.0	1.3
Sep 17	0.4	0.8	1.0
Oct 3	0.4	0.1	0.9
	0.6	0.9	1.12

Examination of tables B-3 and B-6 does indicate that water clarity near the dam will be improved as a result of the higher conservation pool level. While this may be aesthetically pleasing, it also creates conditions favorable to algal growth. The primary factors limiting phytoplankton growth in Red Rock Reservoir are short retention times 2/ and insufficient light penetration due to excessive turbidity 3/.

2/ Beckert, C. A. 1981. Temperal and Spatial Distribution of Planktonic Diatoms in Red Rock Reservoir, Iowa. Ph.D. Dissertation Library, Iowa State University, Ames, Iowa.

3/ Soballe, D. M. 1981. The Fate of River Phytoplankton in Red Rock Reservoir. Ph.D. Dissertation Library, Iowa State University, Ames, Iowa.

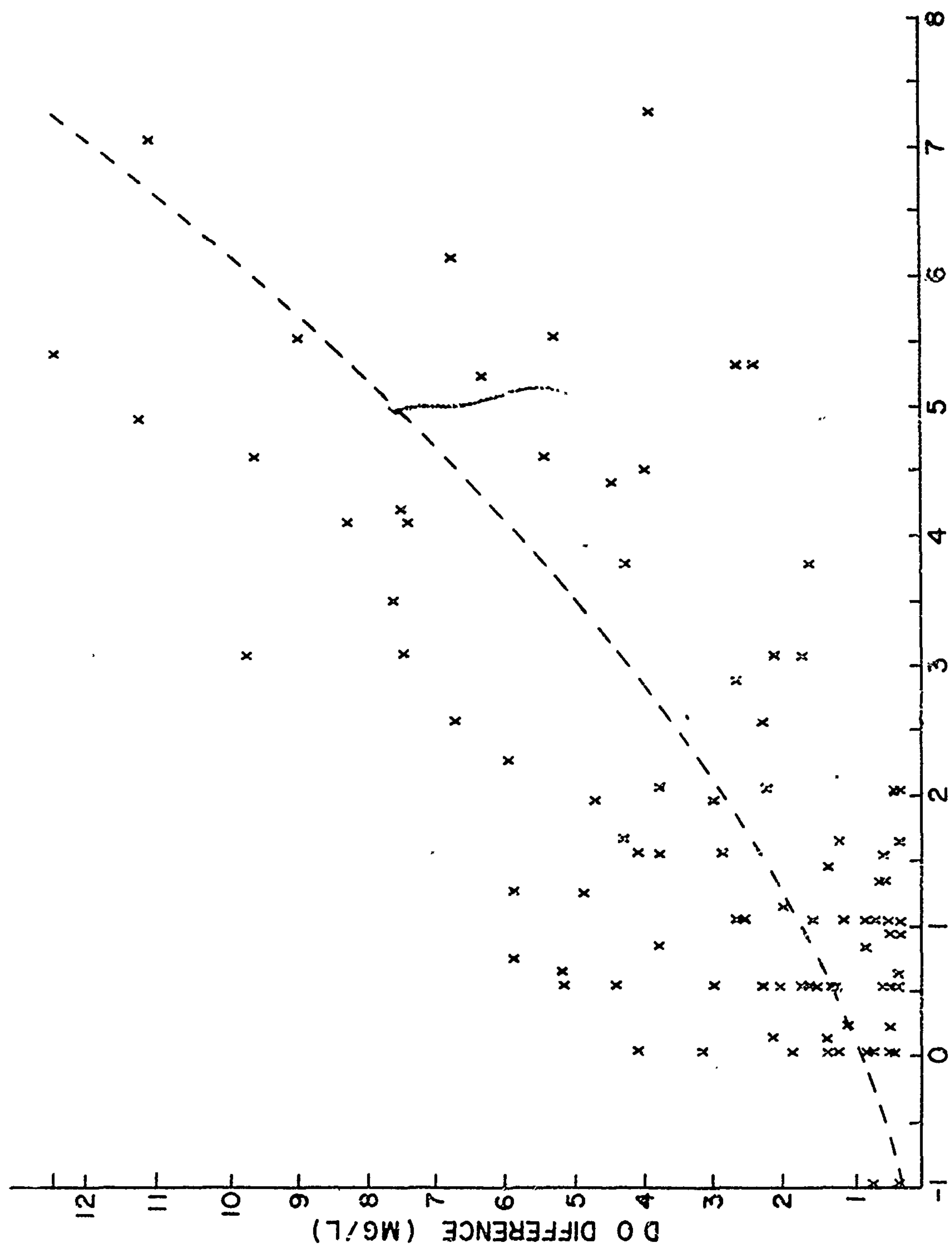
In general, increased water retention times tend to result in higher phytoplankton populations. This is due to: (1) increased water clarity, (2) increased incubation time for phytoplankton growth, and (3) a reduced mixing zone thereby concentrating the algae in the surface waters. Comparing turbidity values with average water retention times produces a negative relationship; the longer water remains in the impoundment, the longer suspended materials have to fall out of suspension. The resulting increased water clarity increases the depth of the euphotic zone, thereby providing a greater volume of water for phytoplankton growth.

When short water retention times exist, phytoplankton may be "flushed through" the reservoir before any population growth can occur. The decline in cell numbers during these periods is thus due to the loss of cells through discharge from the reservoir with little or no replenishment via new cell production. Retention times on the order of 2 to 3 weeks seem to allow adequate time for at least minimal cell production, often exceeding the loss of cells through sedimentation and loss due to flow through the reservoir.

If thermal stratification also exists, algal growth may be additionally promoted by concentrating algae in the upper portion of the reservoir. Under uniform mixing conditions, surface water can readily mix with water from greater depths, thus temporarily removing phytoplankton from the euphotic zone. When a thermocline is established, the mixing zone is effectively reduced, thereby reducing the volume of water to which phytoplankton may be transported. This not only concentrates existing phytoplankton cells in a smaller volume of water, but it also allows the cells to remain in the euphotic zone for a greater period of time, thus facilitating photosynthesis.

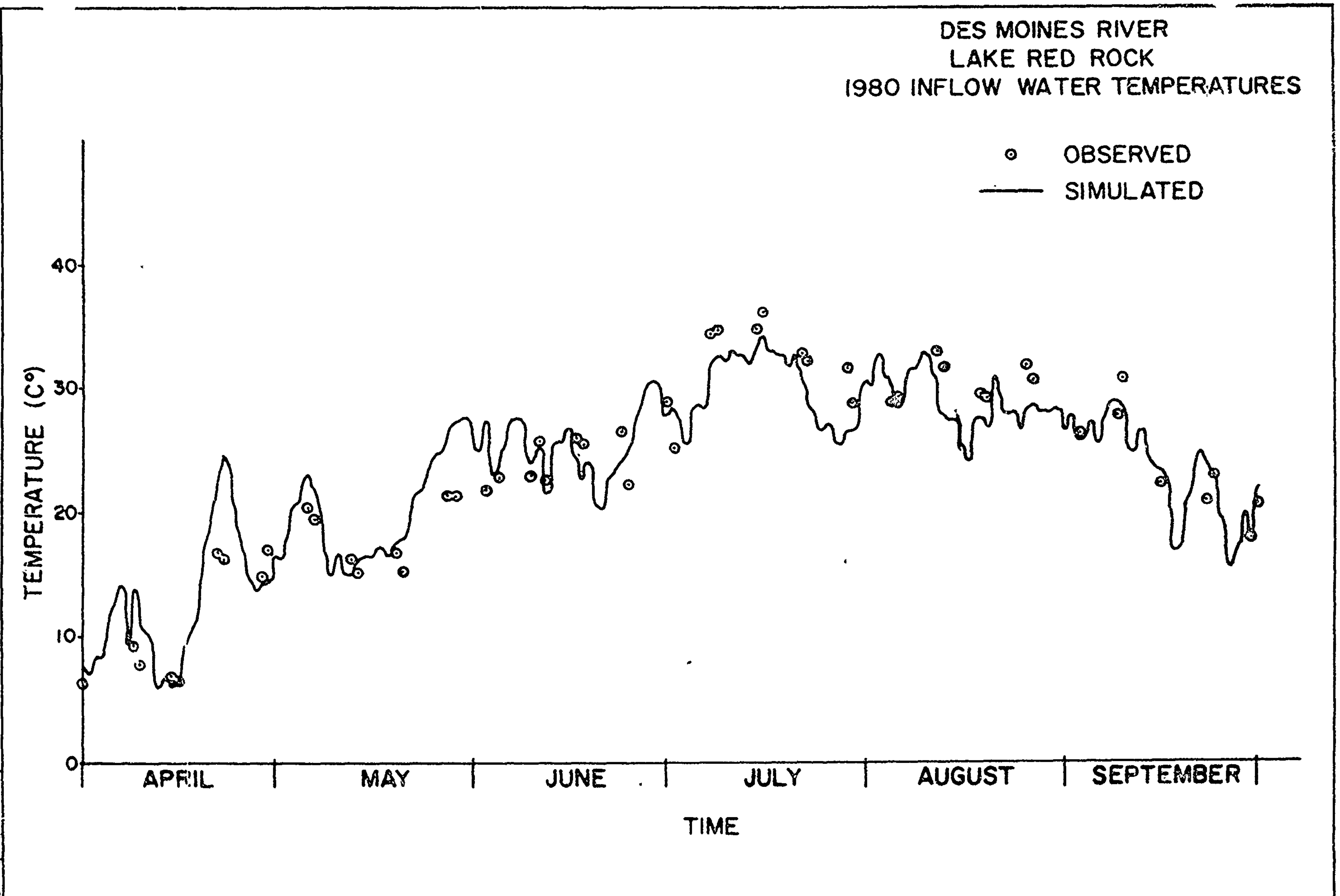
During 1979 and 1980, retentions were on the order of 10 days. If the conservation pool had been maintained at elevation 742 feet NGVD during those years, retention times would have been close to 30 days. An even greater increase in retention times would have occurred in 1977 (24 days at 728 feet NGVD, 100 days at 742 feet NGVD).

Under these conditions, significant increases in phytoplankton growth can be expected even if thermal stratification does not occur. This potential for algal growth could lead to aesthetically undesirable conditions. Contact recreational sports, in particular, would be affected. However, this by itself does not appear to be a problem serious enough to rule out a conservation pool of 742 feet NGVD.



TEMPERATURE DIFFERENCE BETWEEN
SURFACE AND BOTTOM
VERSUS
D.O. DIFFERENCE BETWEEN
SURFACE AND BOTTOM

PLATE D-1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LAKE RED ROCK
1980 INFLOW WATER TEMPERATURES
OBSERVED
SIMULATED
TEMPERATURE (C°)
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30
20
10
0
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
TIME

PLATE D-2

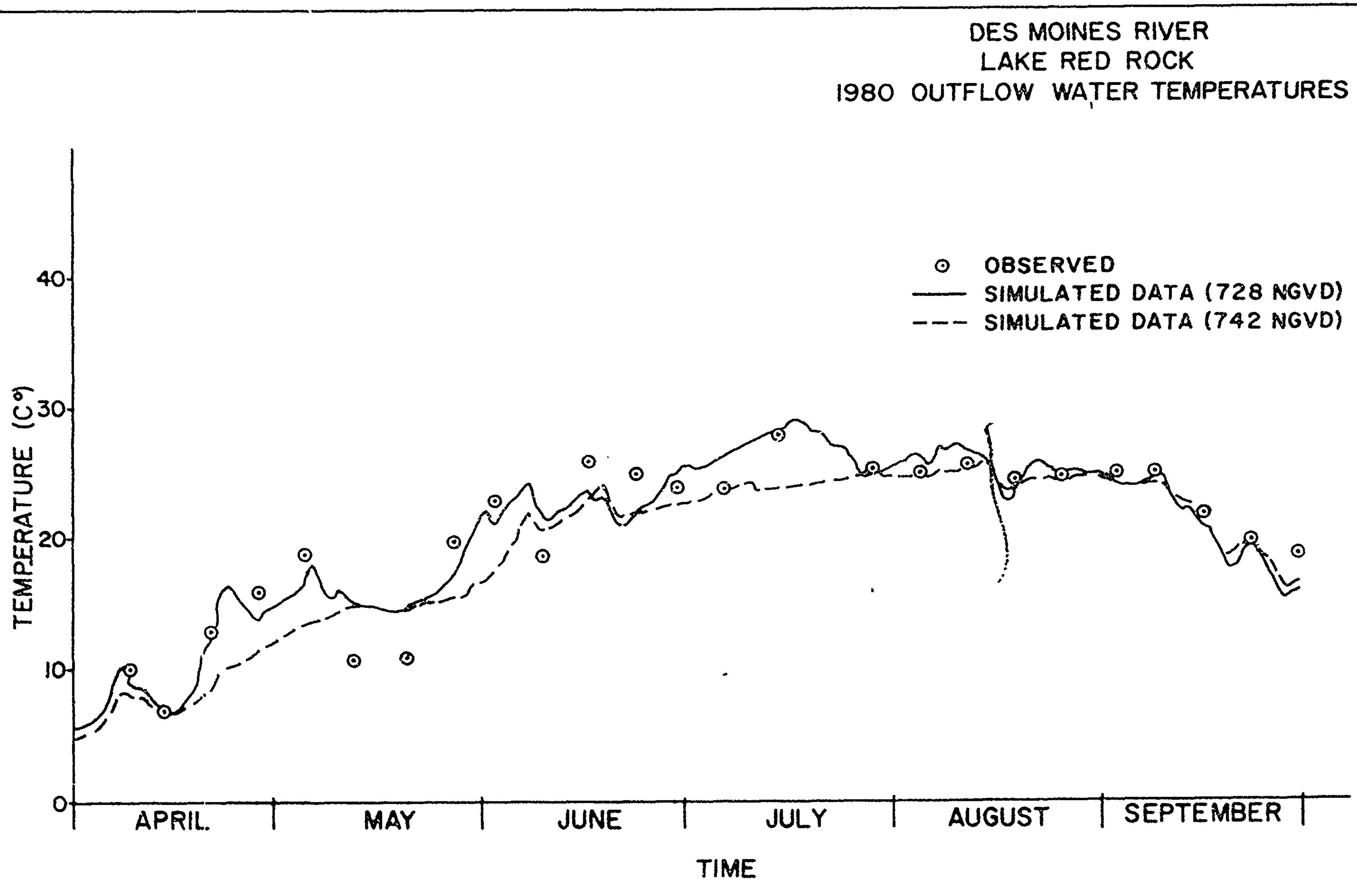
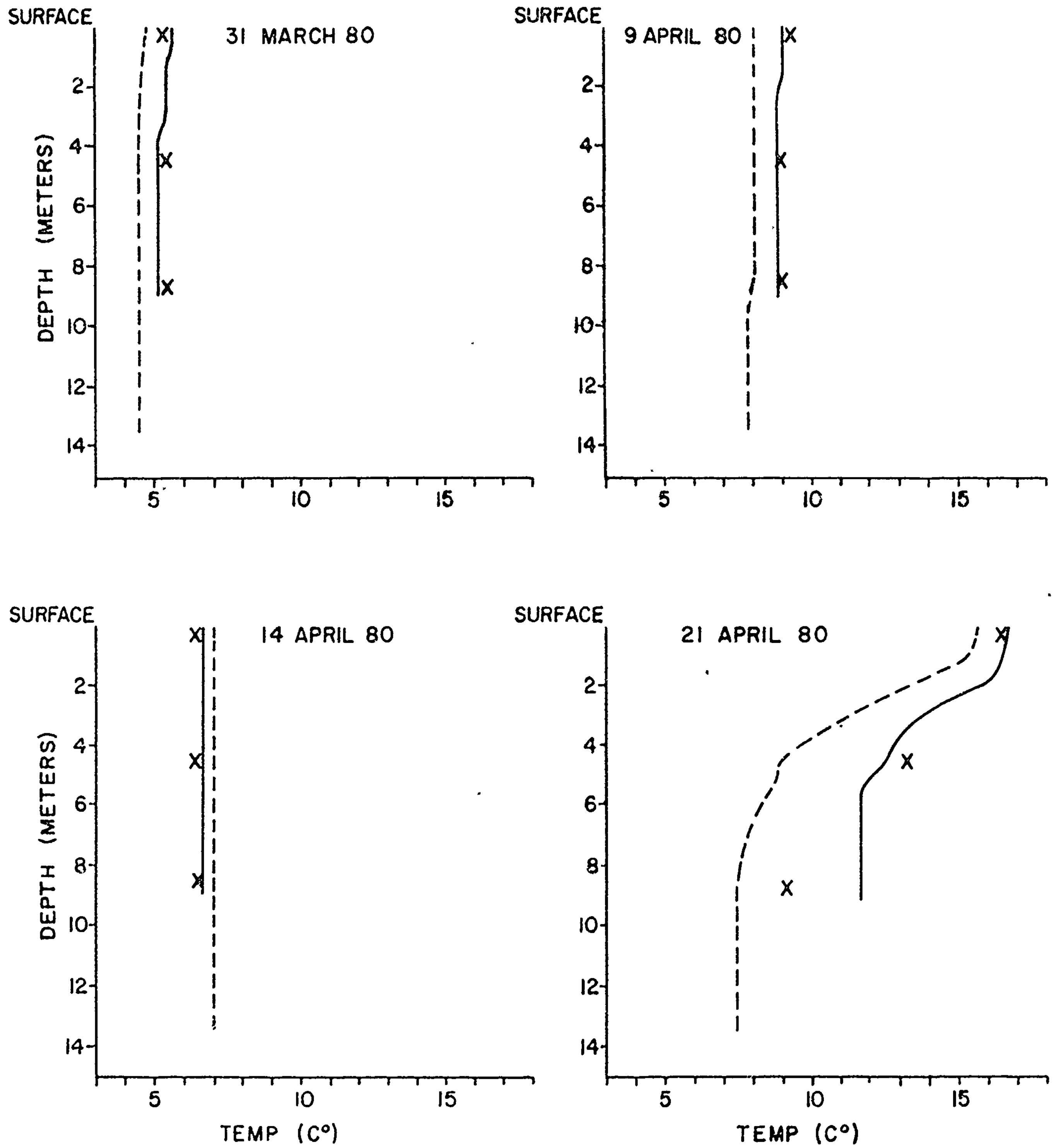

DES MOINES RIVER
LAKE RED ROCK
1980 OUTFLOW WATER TEMPERATURES
OBSERVED
SIMULATED DATA (728 NGVD)
SIMULATED DATA (742 NGVD)
TEMPERATURE (C°)
40
30
20
10
0
APRIL.
MAY
JUNE
JULY
AUGUST
SEPTEMBER
TIME

PLATE D-8



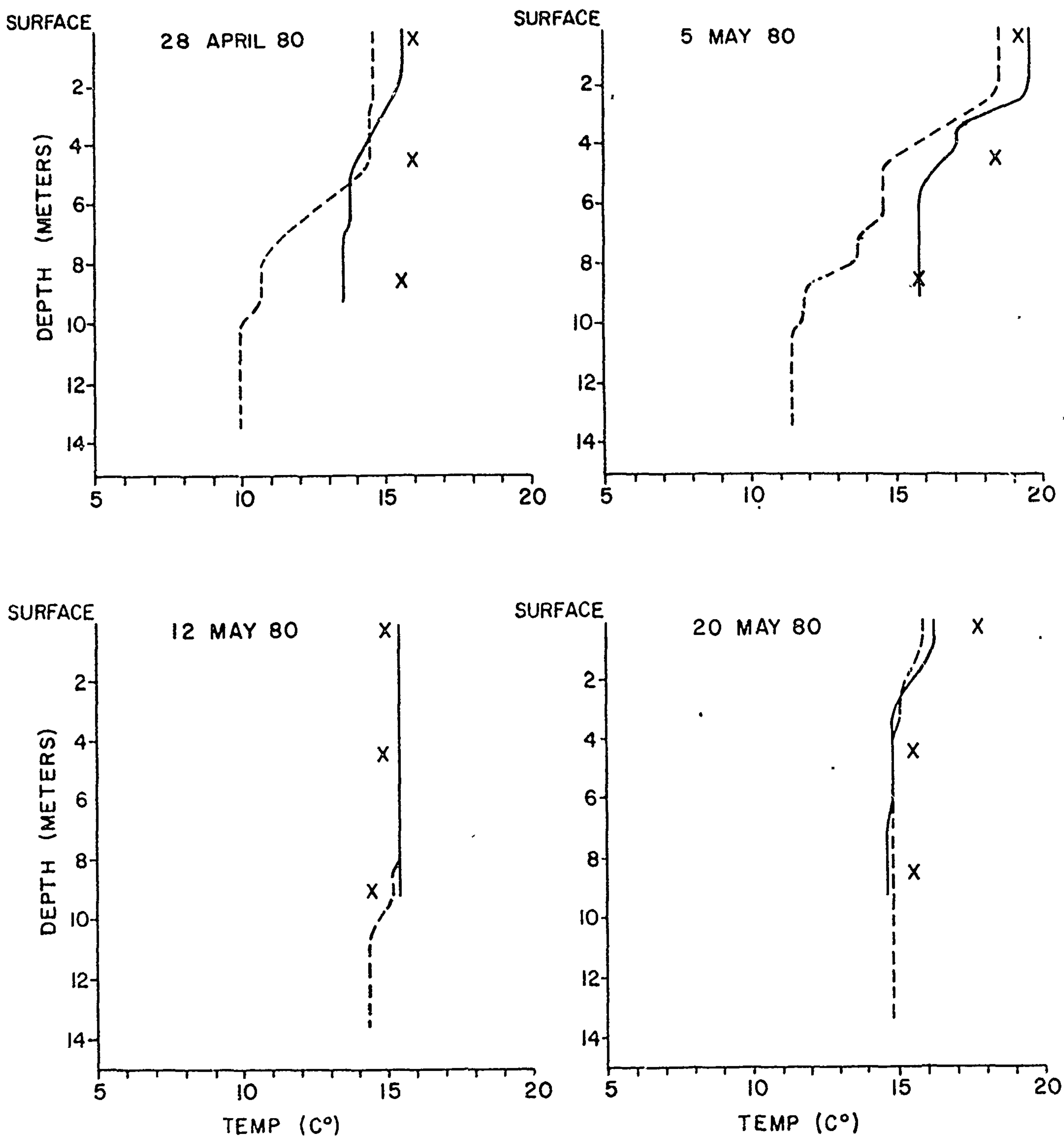
X - OBSERVED DATA

——— SIMULATED DATA (728 NGVD)

- - - - SIMULATED DATA (742 NGVD)

DES MOINES RIVER
LAKE RED ROCK
1980 TEMPERATURE PROFILES

PLATE B-4



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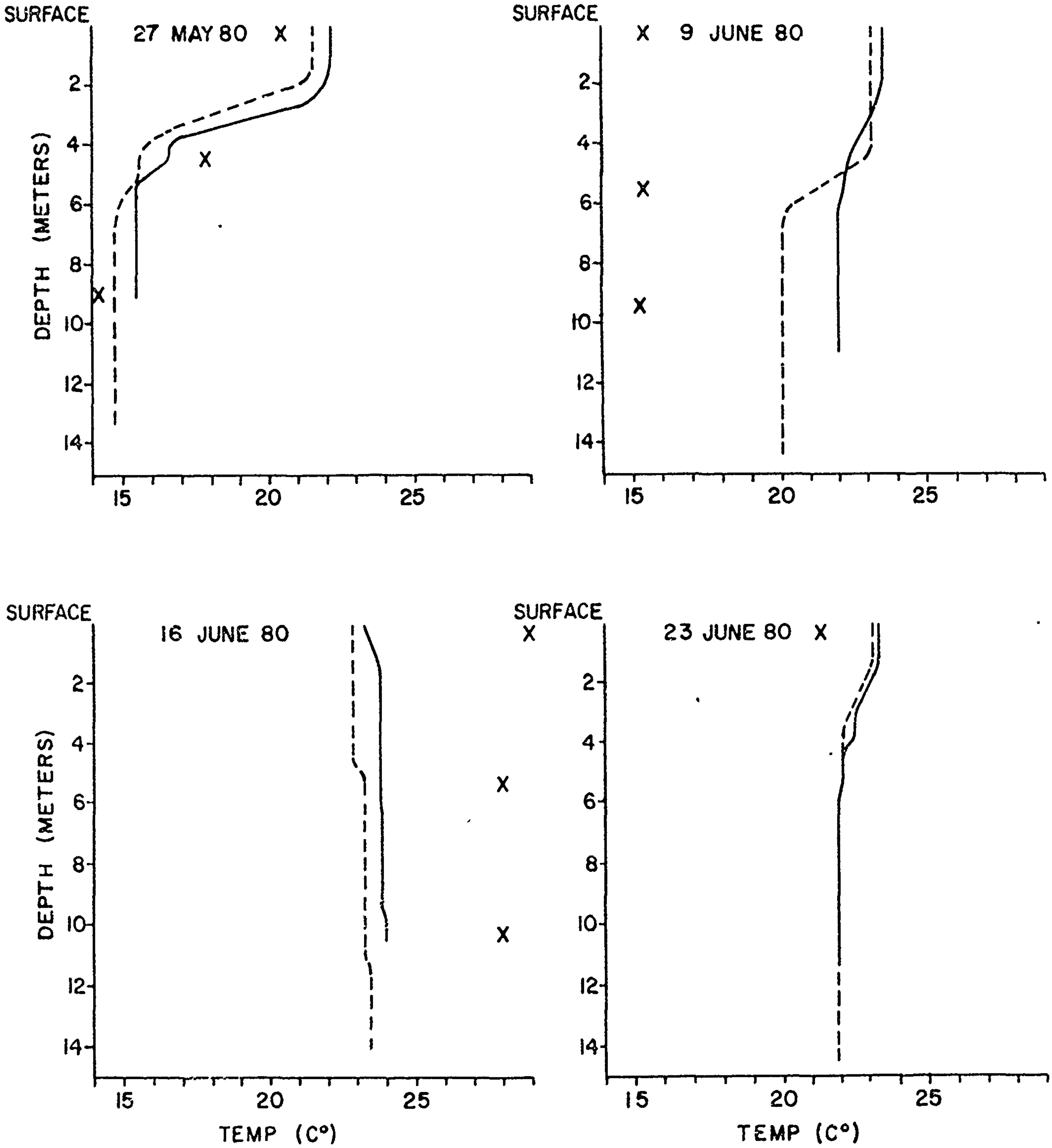
- - - SIMULATED DATA (742 NGVD)

DES MOINES RIVER
LAKE RED ROCK
1980 TEMPERATURE PROFILES

PLATE B-5



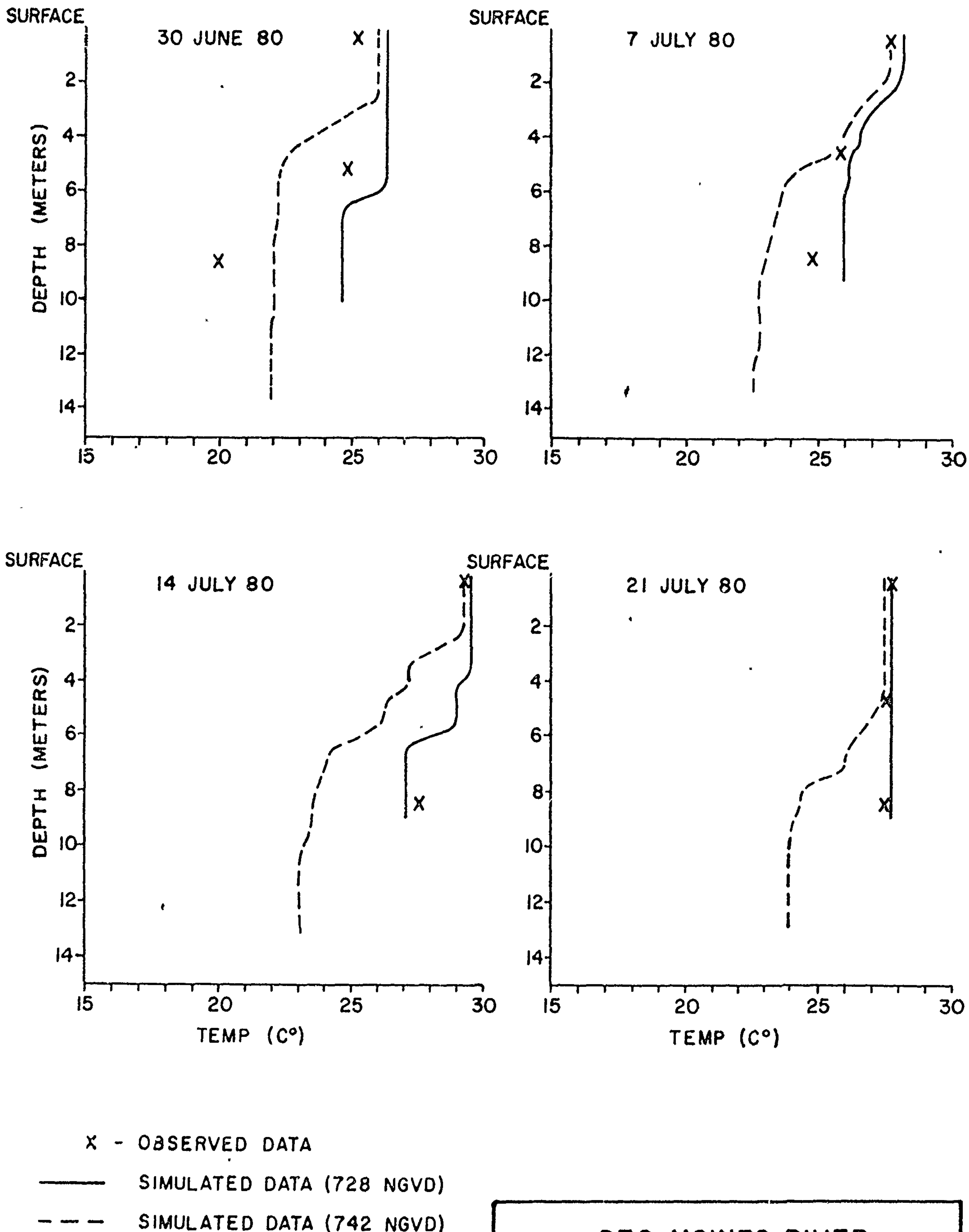
X - OBSERVED DATA

SIMULATED DATA (728 NGVD)

SIMULATED DATA (742 NGVD)

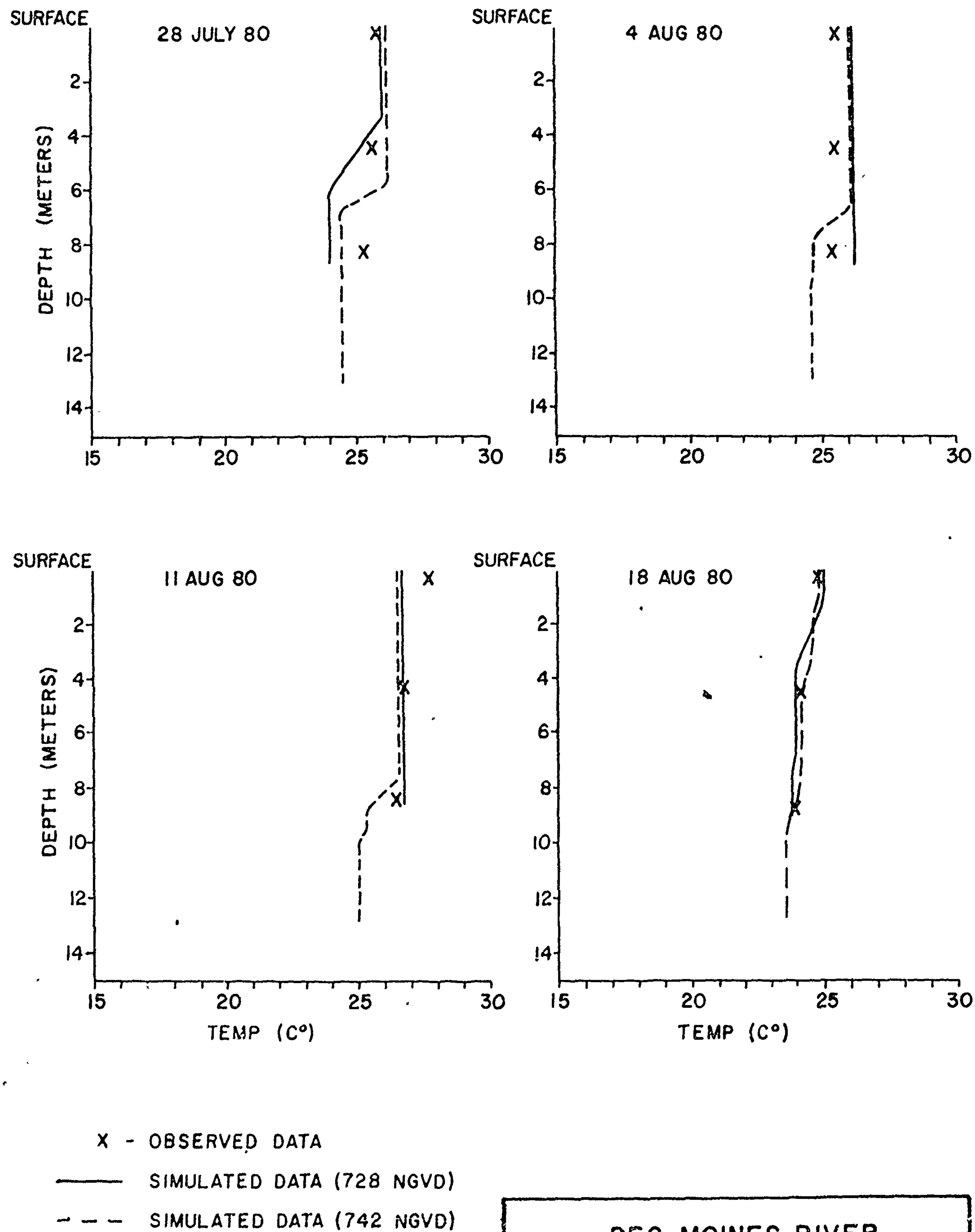
DES MOINES RIVER
LAKE RED ROCK
1980 TEMPERATURE PROFILES

PLATE B-6



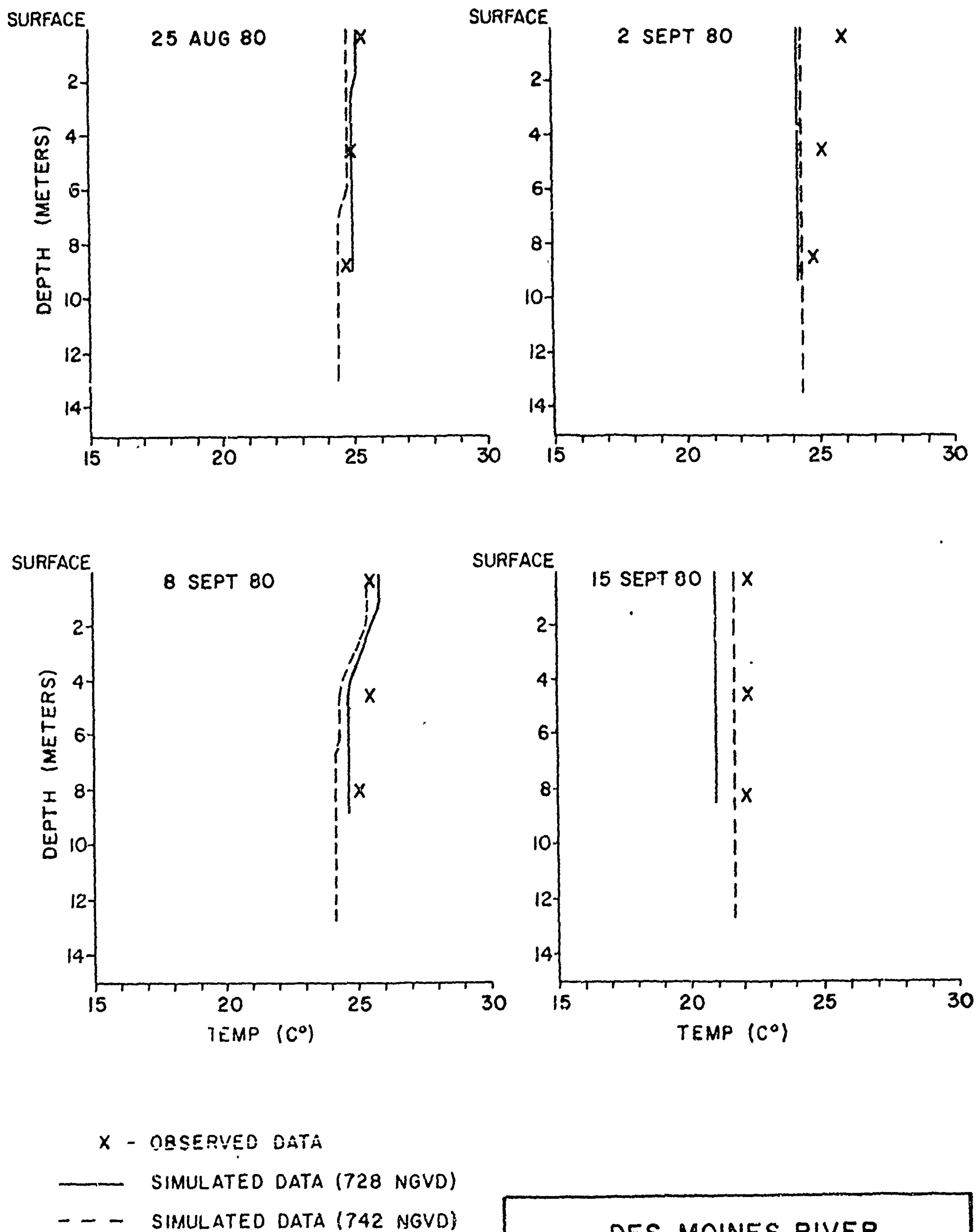
DES MOINES RIVER
LAKE RED ROCK
1980 TEMPERATURE PROFILES

PLATE B-7



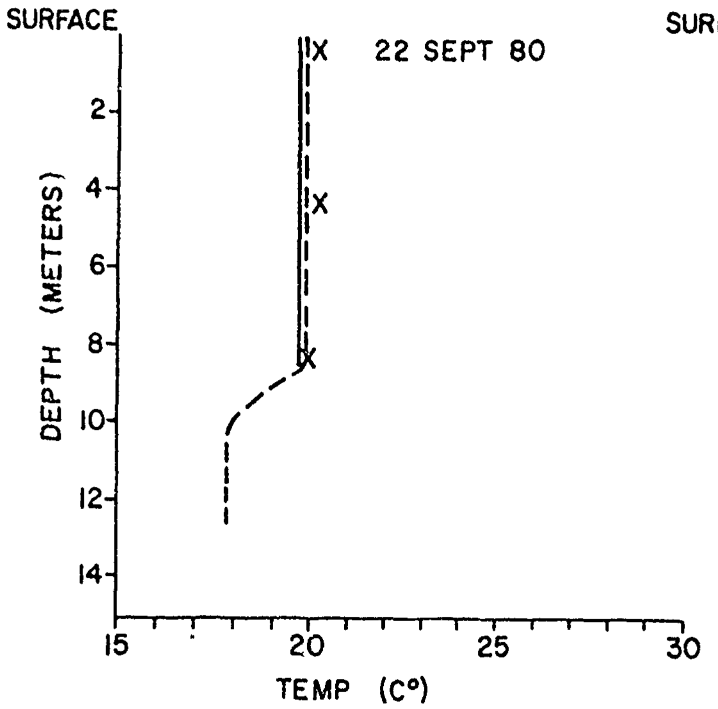
DES MOINES RIVER
LAKE RED ROCK
1980 TEMPERATURE PROFILES

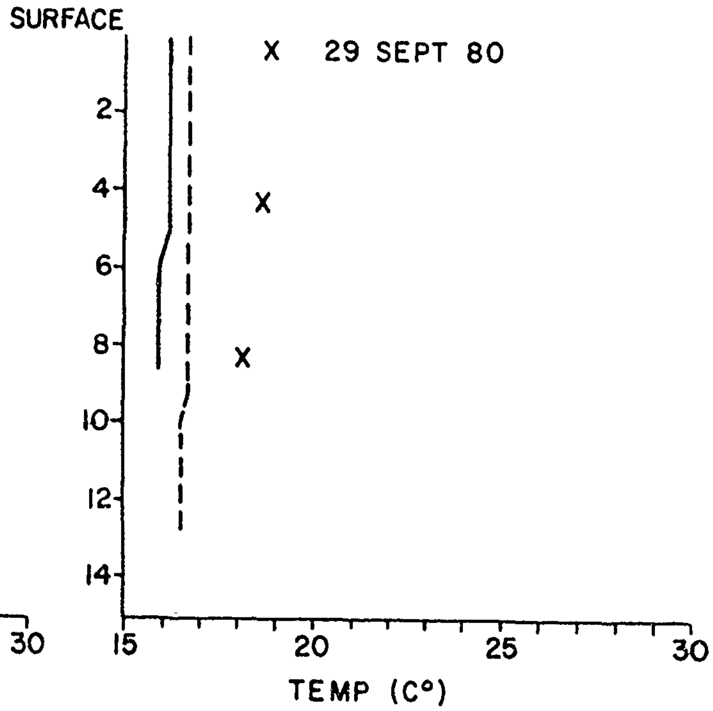
PLATE B-8



DES MOINES RIVER
LAKE RED ROCK
1980 TEMPERATURE PROFILES

PLATE B-9





X - OBSERVED DATA

——— SIMULATED DATA (728 NGVD)

– – – SIMULATED DATA (742 NGVD)

DES MOINES RIVER
LAKE RED ROCK
1980 TEMPERATURE PROFILES

PLATE B-10

APPENDIX C

RED ROCK SEDIMENT ENTRAPMENT

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX C
RED ROCK SEDIMENT ENTRAPMENT

TABLE OF CONTENTS

List of Tables

List of Plates

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX C
RED ROCK SEDIMENT ENTRAPMENT

GENERAL DESCRIPTION

The Red Rock Reservoir is located on the Des Moines River, about 60 miles downstream from the city of Des Moines, Iowa, and 142.9 miles above its confluence with the Mississippi River. The reservoir has been in operation since March 1969. The total drainage area upstream of the dam is 12,323 square miles.

The dam is a rolled earthfill type, 5,676 feet long and 110 feet high (maximum). The crest elevation is 797 feet NGVD (National Geodetic Vertical Datum of 1929). The reservoir averages about 2.0 to 2.5 miles in width, extends upstream about 33.5 miles, and occupies about 65,500 acres of land. The original capacity of the reservoir was 90,000 acre-feet at the conservation pool level of 725 feet NGVD and 1,830,000 acre-feet at elevation 780. The gated spillway is 241 feet wide, with five tainter gates (46 feet by 41 feet), and has a top elevation of 781 feet NGVD with gates closed. The outlet structure consists of 14 conduits, 5 feet wide and 9 feet high, having a total discharge capacity of 37,500 cubic feet per second (ft^3/s) at elevation 780. The original elevation-capacity relation and those from the 1977 and 1984 surveys are given in table C-1.

TABLE C-1

Elevation-Capacity Relation for 1969, 1977, and 1984

Elevation (Ft. NGVD)	Capacity in Acre-Feet		
	1969 (Orig.)	1977 Survey	1984 Survey
690	0		
691		0	
700	1,475	650	300
705	4,596	2,125	1,200
710	11,550	6,500	3,940
715	25,818	15,800	11,900
720	51,870	33,750	27,650
725	90,000	63,430	50,700
730	141,900	110,250	89,200
735	208,580	174,380	149,100
740	291,860	255,890	226,400
745	393,790	357,180	324,100
750	516,550	479,030	445,000
755	661,560	622,830	588,500
760	828,100	788,840	753,600
765	1,022,675	983,300	947,500
770	1,252,900	1,213,140	1,177,500
775	1,521,740	1,481,540	1,444,300
780	1,830,000	1,789,580	1,750,350
Total Sediment Deposit (ac-ft)		40,420	79,650

A comparison of these storage values indicates that 79,650 acre-feet of storage has been lost due to the accumulation of sediment in the reservoir during about 16 years of operation. This results in an average loss rate of about 5,000 acre-feet per year. The original flood control storage was 1,740,000 acre-feet (1,830,000 - 90,000). The flood control storage provided, based on the 1984 survey with the conservation pool raised from 725 to 728 feet NGVD, was 1,677,350 acre-feet (1,750,350 - 73,000). This indicates only a 4 percent ((1,740,000 - 1,677,350) / 1,740,000)) or less reduction in the flood control storage available. However, the storage available at elevation 725 feet NGVD has been reduced by nearly 44 percent ((90,000 - 50,700) / 90,000)). These numbers illustrate that in spite of sedimentation the project continues to provide the required flood control. However, the conservation pool which provides for low-flow augmentation and recreation has been significantly reduced in volume. The resulting

smaller depths have primarily affected recreational uses. In order to replace the lost conservation storage, seven alternative plans were developed as described in the main report. This appendix evaluates the sedimentation impacts of five of these plans.

METHODOLOGY

The prediction of future sediment entrapment volumes is dependent on many unknown factors such as runoff volumes and sediment yields, as well as the operation of the reservoir. A computer program called SEDRES was developed through efforts of the Iowa State Water Research Institute in order to numerically model the interaction of the most important and quantifiable factors. The Rock Island District contracted with the Iowa Institute of Hydraulic Research (IIHR) to develop a version of SEDRES specifically for the Red Rock project. This work was completed and presented in a 1979 IIHR report numbered 226 entitled A Numerical Model for Computation of Sediment Action in Lakes and Reservoirs, Part II, Sedimentation in Red Rock Reservoir. The SEDRES model predicts future elevation-storage relationships based on input which includes reservoir inflows and elevations, sediment inflows, and sediment characteristics.

RESERVOIR INFLOWS AND ELEVATIONS

Daily reservoir inflows and subsequent pool elevations for the five operation plans were developed using the SAYRED model and 64 years (1921-1984) of record. SAYRED is a computer program that models the tandem operation of Saylorville and Red Rock Reservoirs (see appendix A). Main input data into the SAYRED program are the most recent elevation-area-capacity relation -eration plans (1984-1985) and streamflow records. In this study, the -- from SAYRED (daily pool elevations and flows) were converted into we averages and used as data for the prediction of future reservoir conditions.

SEDIMENT INFLOWS

Sediment inflows to the Red Rock Reservoir consist of contributions from the main stem Des Moines River (which includes outflow from Saylorville Lake) and five tributaries (Raccoon, North, South, and Middle Rivers, and White Breast Creek) which join the Des Moines River downstream of Saylorville Lake. Sediment records on the Des Moines River earlier than 1977 are not applicable in the present situation, since Saylorville Lake started operation in 1977. Therefore, the only appropriate data sources are the suspended sediment records of the tributaries. Whitebreast Creek has only 7 years of record, whereas the other tributaries have the same 7 years plus about 7.8 years.

Recognizing the above limitation on available data, the total sediment inflow to Red Rock Reservoir is considered to be the sediment loads of the Raccoon, North, South, and Middle Rivers for which sediment data are available for 1969-1983, plus some percentage of this load, as an adjustment to account for contributions from other sources (Whitebreast, Saylorville outflow, small creeks, and bedload). The average annual suspended sediment load of these four major tributaries is 3,804,000 tons. The actual recorded sediment loads are used repetitively to generate the years of sediment record required in the study.

a. Adjustment for the contribution by Whitebreast Creek is calculated by using the ratio of the average annual sediment yield for the 7 years of record, to the sum of annual sediment yields of the four tributaries.

Adjustment Factor for Whitebreast Creek (AF_1)

$$AF_1 = 1.0 + \frac{\text{Annual sediment yield (tons) of Whitebreast Creek}}{\text{Total annual sediment yield of Raccoon, North, South and Middle Rivers}}$$

$$= 1.0 + (4.28 \times 10^5 / 38.04 \times 10^5)$$

$$AF_1 = 1.11$$

b. The adjustment factor for overland flow from drainage areas not covered by gaging stations is determined by the ratio of the drainage area not covered to the sum of drainage areas of the four tributaries.

Station		Drainage Area (Sq. miles)
Raccoon R. @ VanMeter		3,441
North R. @ Norwalk		349
South R. @ Ackworth		460
Middle R. @ Indianola		503
	Total	4,753

Drainage below Saylorville = (Red Rock - Saylorville)
= (12,323 - 5,823)
= (6,500 square miles)

Adjustment factor for drainage areas not covered by gaging stations (AF_2)

$$AF_2 = 1.0 + \frac{(6,500 - 4,753)}{4,753}$$

$$AF_2 = 1.37$$

c. The adjustment factor for the sediment outflow from Saylorville Lake is calculated by the ratio of estimated annual sediment outflow from the lake to the total annual sediment yield from the four tributaries. The Saylorville Lake is estimated to trap 625 acre-feet per year with a trap efficiency of 74 percent (Johnson 1976). Thus, the sediment load downstream of the lake is estimated as 625 x (1-.74)/.74 = 220 acre-feet/year, which is equivalent to 239,580 tons/year, assuming a unit weight of 50 lbs/ft^3.

Adjustment factor for outflow from Saylorville Lake (AF_3)

$$AF_3 = 1.0 + (239,580/3,804,000)$$

$$AF_3 = 1.06$$

d. The adjustment factor for bedload (AF_4 is estimated herein as 1.10). Hence, the overall adjustment factor for sediment inflow (AF) equals:

$$AF = AF_1 \times AF_2 \times AF_3 \times AF_4$$

$$= 1.11 \times 1.37 \times 1.06 \times 1.10$$

$$AF = 1.77$$

SEDIMENT CHARACTERISTICS

The sediment fractions and density characteristics used were obtained from the Sedimentation in the Red Rock Reservoir Report, 1979. Sediment inflow fractions are estimated as 50 percent clay, 48 percent silt, and 2 percent sand. Two levels of submergence are used to account for the compaction in the reservoir: sediment always submerged (lower level) and sediment occasionally submerged (upper level).

MODEL CALIBRATION

The latest Red Rock Reservoir sediment survey was completed in 1984. Results of this survey, along with the 1977 elevation-capacity relation, water inflows, pool elevations, and sediment inflows were used to calibrate the SEDRES model. Three parameters, B, AF, and x, were adjusted to fit observed data. B is the first trial value of the fraction of the total incoming sediment volume in any interval, which is to be placed in dead storage for computing a new zero elevation; AF is the adjustment factor for multiplication with the estimated sediment inflow values; and x is the weighting factor associated with the height of sediment distribution. The selected values of B = 0.0035, AF = 1.70, and x = 0.20 were chosen after many simulations, with varying parameter values, to obtain the best fit to the observed data.

A fourth parameter used in the calibration is the method by which sediment entrapment is computed. Two methods, Churchill's and Brune's, are generally available for estimating the trap efficiency of reservoirs. Brune's method is based primarily on a function of the ratio of reservoir volume (capacity) to inflow rates - C/I. Brune's method with capacity corresponding to the maximum pool elevation during the period was used in this study. Brune's method relates the trap efficiency to the ratio between capacity and water inflow, both in acre-feet. Plate C-1 shows both the 1977 and 1984 survey elevation-capacity curves. The computed elevation-capacity curve from the final calibration also is shown. As can be seen on plate C-1, the elevation-capacity relation obtained from the computed run compares faborably with the elevation-capacity curve from the 1984 survey data.

PREDICTION OF SEDIMENTATION

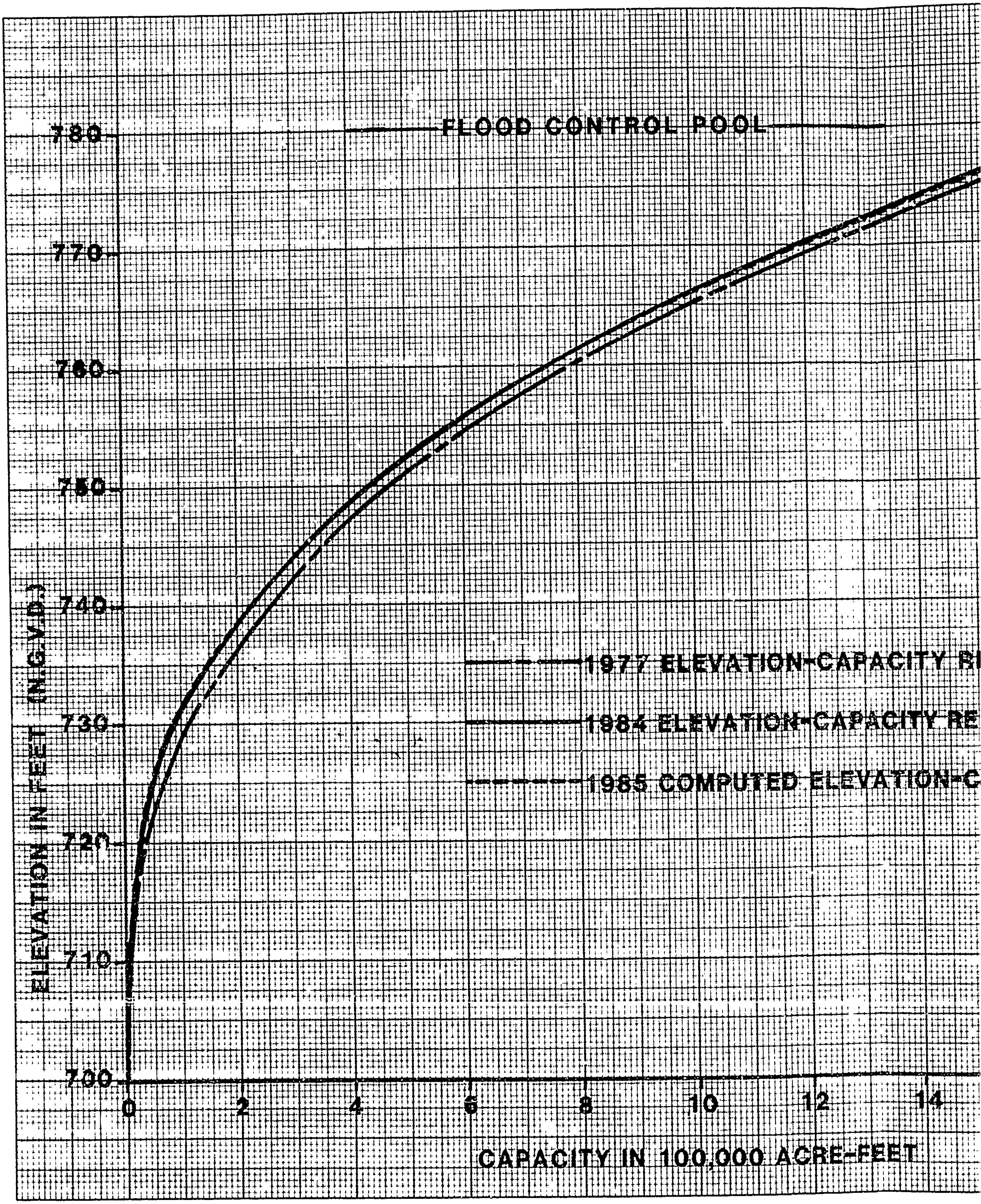
The computer model SEDRES was used to predict sediment quantities deposited over 85 years of simulation, starting in 1984. Five different operation plans were used for simulation. Weekly water inflows, sediment inflows, and pool elevations were used as direct input to the model. Actual sediment distribution data obtained from the 1984 survey were used for distributing deposited sediments as a function of elevation. The elevation-area-capacity relation obtained from the 1984 survey was used as input to the model, so that the base year for the predicted values is 1984. The predicted elevation-capacity relations and quantities of sediment deposited are computed at intervals of 5 years for each operation plan. The conservation, flood control, and total storages remaining versus time are shown graphically on plates C-2, C-3, and C-4, respectively.

FINDINGS

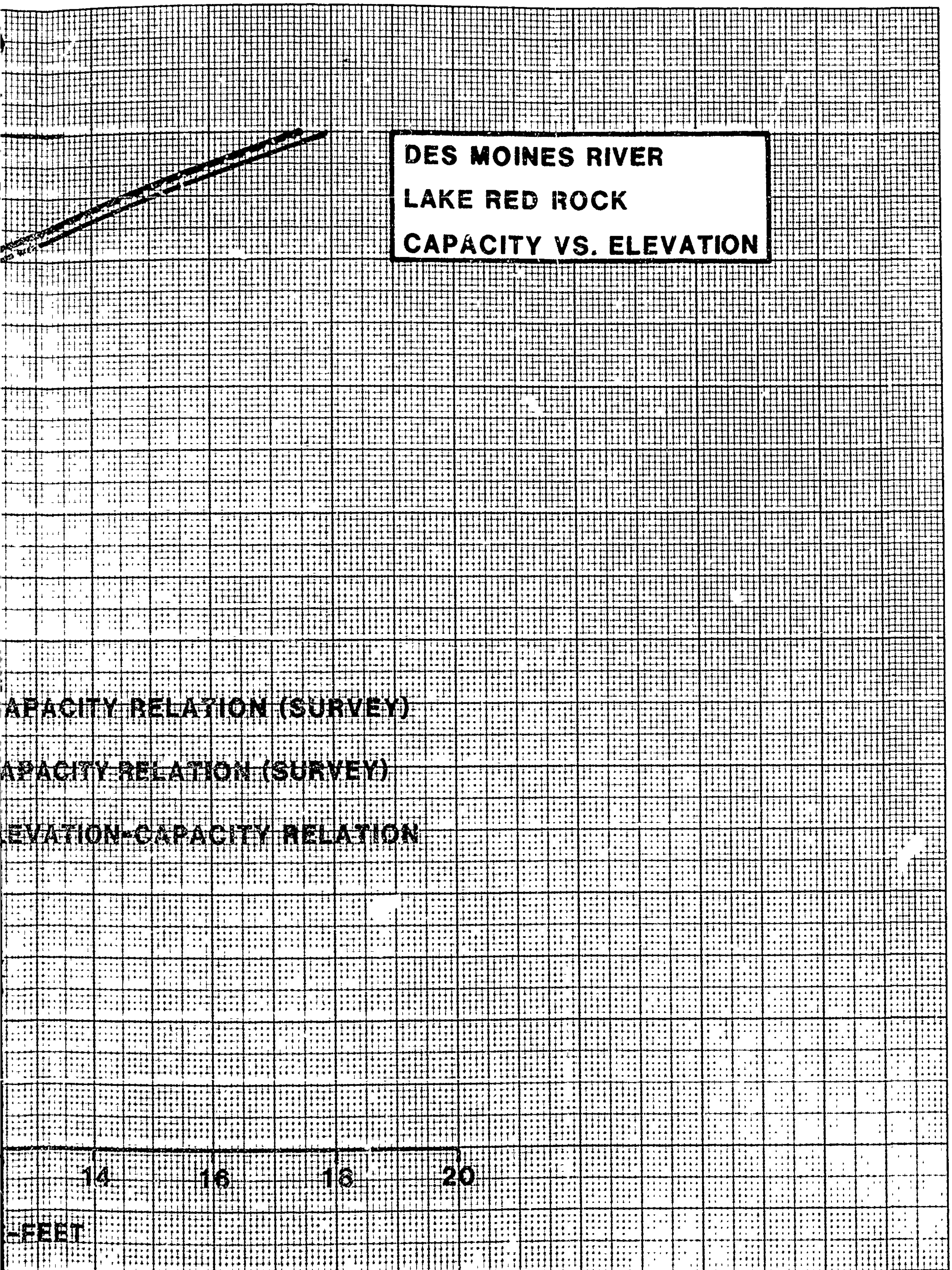
Results from the sediment accumulation study indicate that all five plans are viable. The areas between lines of alternative plans on plate C-3 indicate differences in storage, measured in acre-feet-years, available for flood control during the study period. The reduction in flood control storage is due to conservation pool raises and the accumulation of sediment. Plan 2 results in the most significant reduction in flood storage. The remaining plans have similar but lesser impacts. Although differences in total accumulated sediment are relatively small, as shown on plate C-3, Plan 1 results in the least loss of flood control storage. Mudflats are developing in the upper reaches of the conservation pool. It is believed that this trend will continue regardless of conservation pool level.

Multi-phased increases will provide the required conservation storage while allowing future scheduled raises to inundate mudflats as they develop. Most importantly, the incremental increases will retain as much storage as possible longer for flood control while still providing adequate water depths for recreation. From a sedimentation perspective,

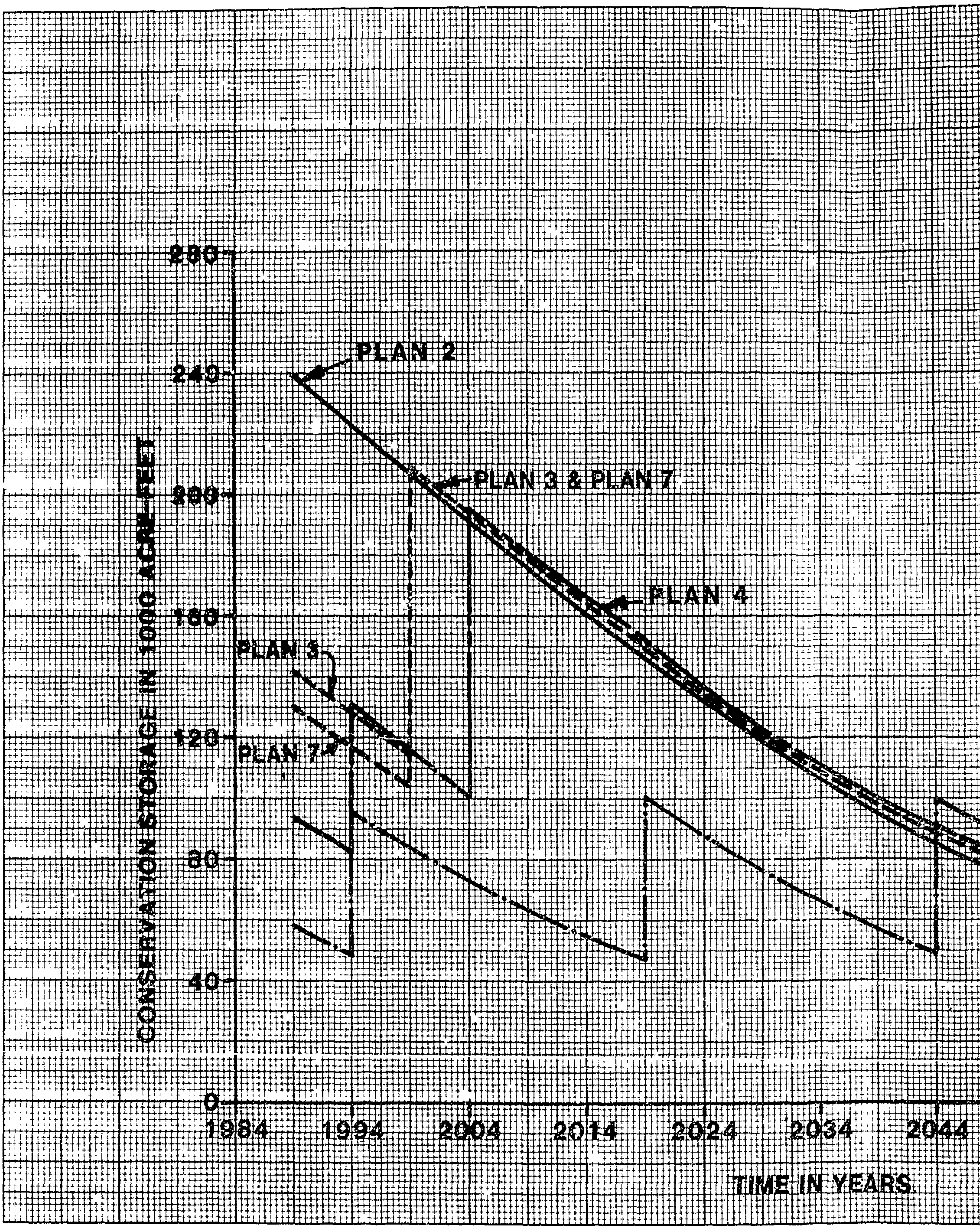
considering the impacts to flood control it is best to raise the conservation pool in small increments over a long period of time. Although the small raises will be aesthetically best due to the inundation of mudflats, sediment and small conservation pool raise impacts will continue to be a concern of recreational interests.



FLOOD CONTROL POOL
780
770
760
750
740
730
720
710
700
ELEVATION IN FEET (N.G.V.D.)
1977 ELEVATION-CAPACITY R
1984 ELEVATION-CAPACITY RE
1985 COMPUTED ELEVATION-C
0
2
4
6
8
10
12
14
CAPACITY IN 100,000 ACRE-FEET



DES MOINES RIVER
LAKE RED ROCK
CAPACITY VS. ELEVATION
APACITY RELATION (SURVEY)
APACITY RELATION (SURVEY)
LEVATION-CAPACITY RELATION
14
16
18
20
-FEET



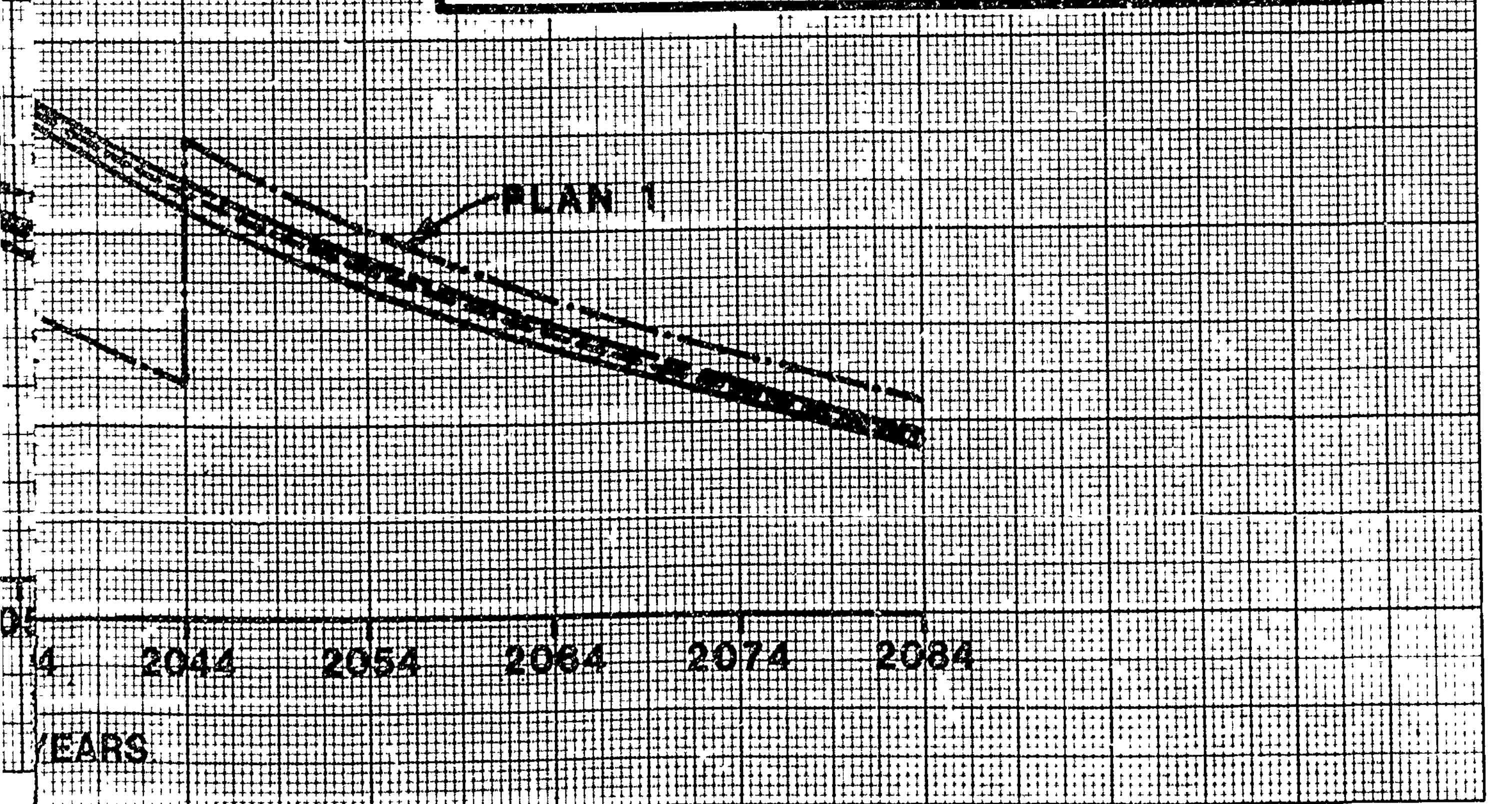
PLAN 2
PLAN 3 & PLAN 7
PLAN 4
PLAN 3
PLAN 7
280
240
200
160
120
80
40
0
1984
1994
2004
2014
2024
2034
2044
CONSERVATION STORAGE IN 1000 ACRE-FEET
TIME IN YEARS

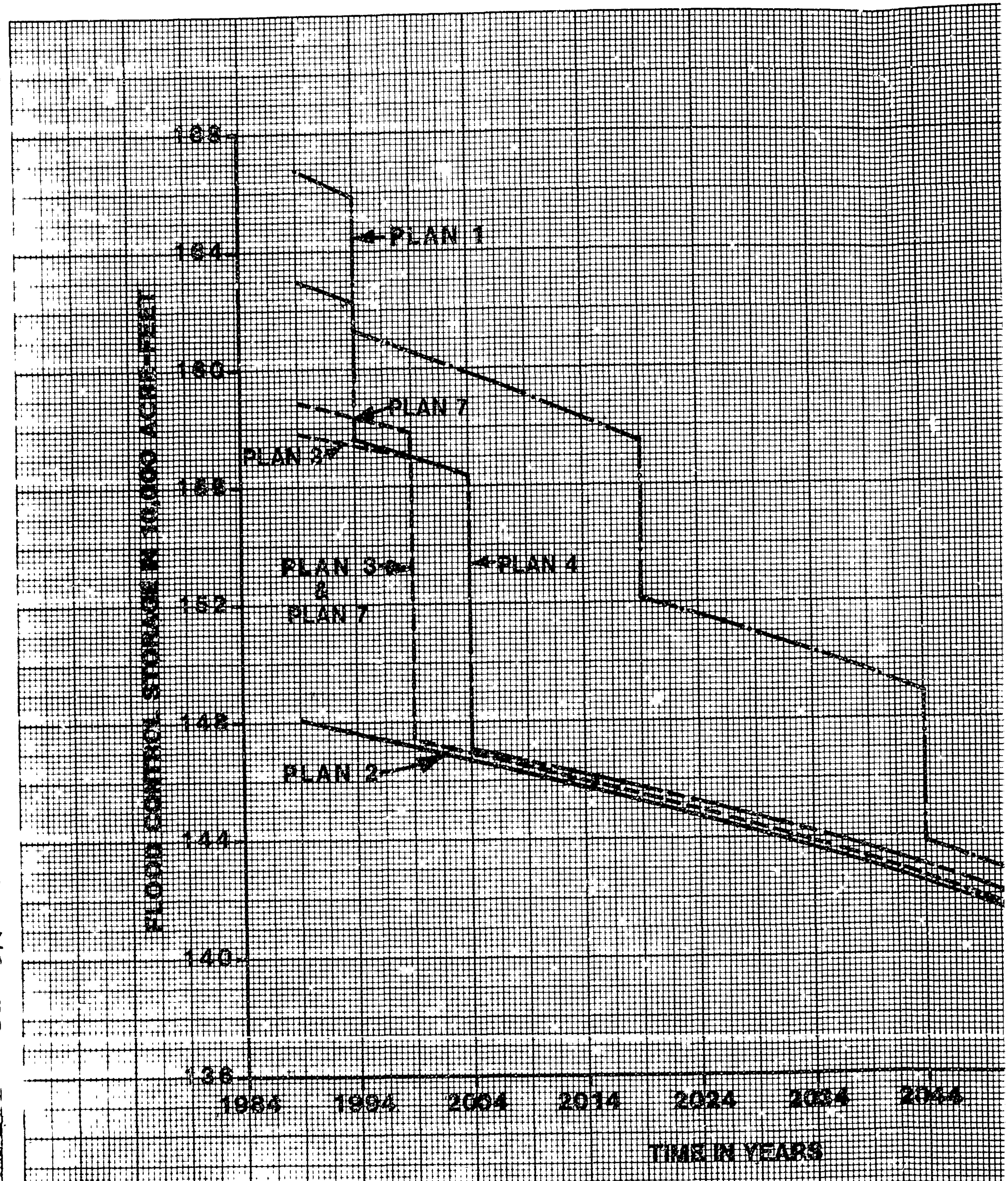
DES MOINES RIVER

LAKE RED ROCK

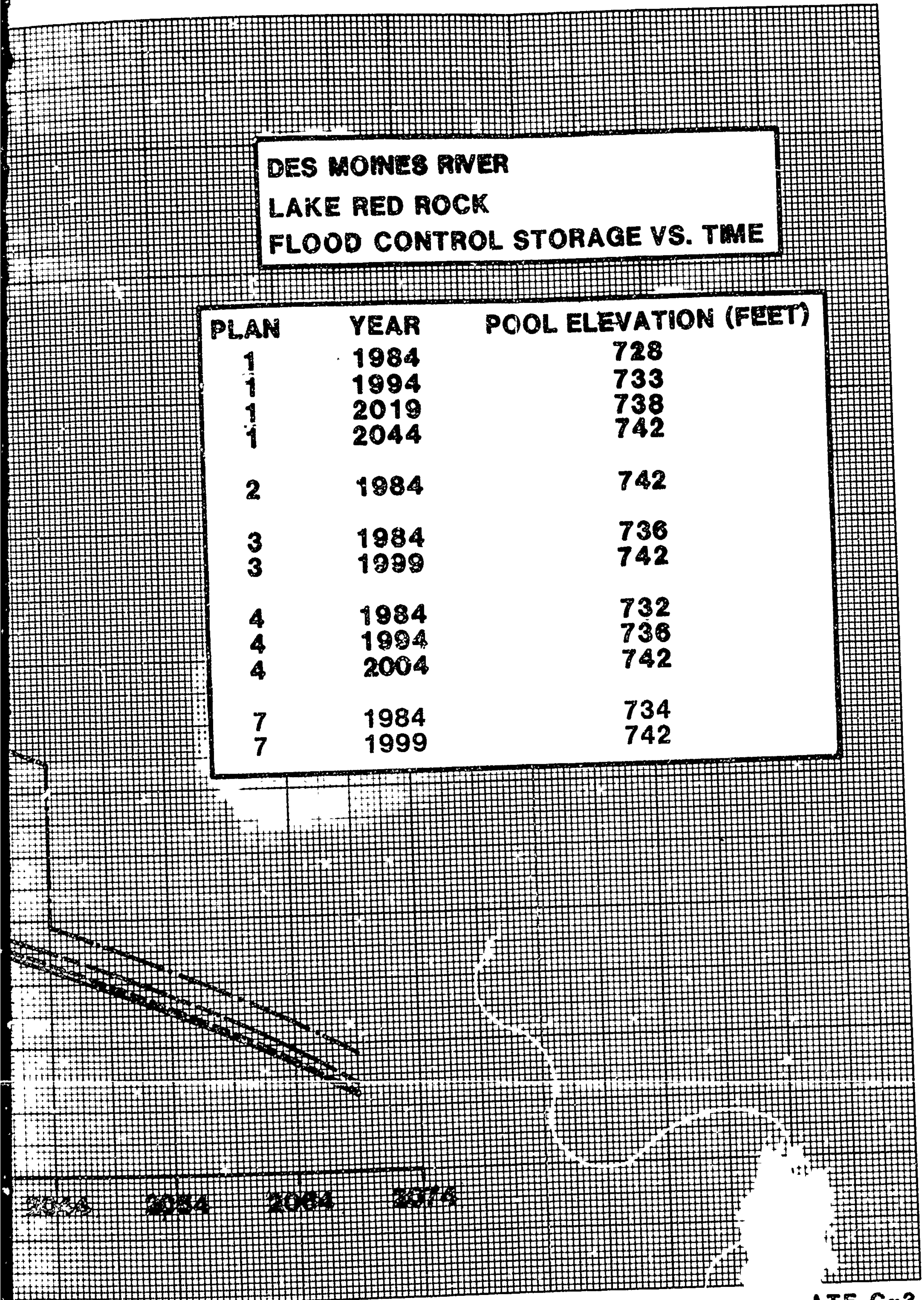
CONSERVATION STORAGE VS. TIME

PLAN	YEAR	POOL ELEVATION (FEET)
1	1984	728
1	1994	733
1	2019	738
1	2044	742
2	1984	742
3	1984	736
3	1999	742
4	1984	732
4	1994	736
4	2004	742
7	1984	734
7	1999	742





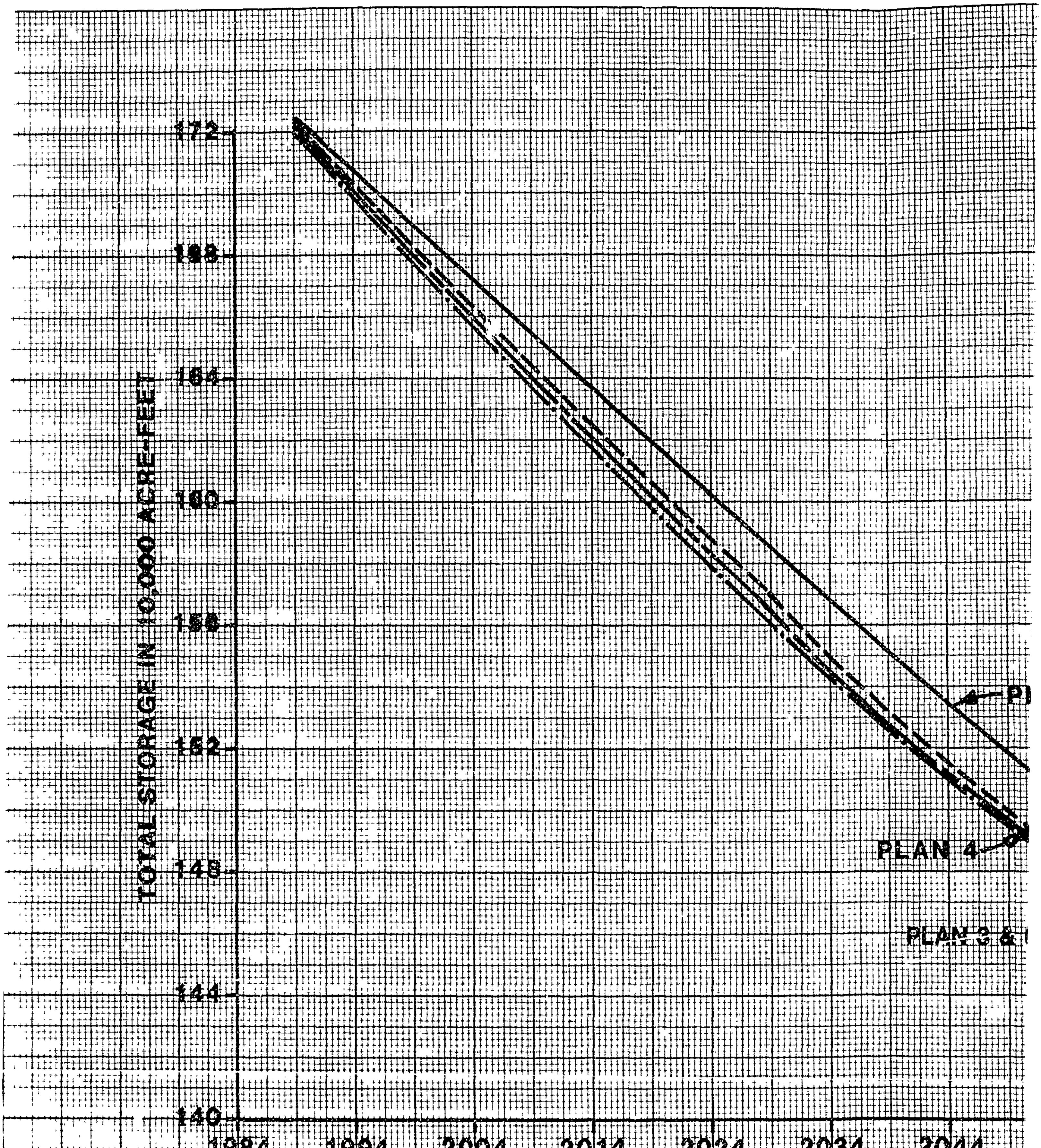
FLOOD CONTROL STORAGE IN 10,000 ACRE-FEET
168
164
160
156
152
148
144
140
136
PLAN 1
PLAN 7
PLAN 3
PLAN 3 & PLAN 7
PLAN 4
PLAN 2
1984
1994
2004
2014
2024
2034
2044
TIME IN YEARS



DES MOINES RIVER
LAKE RED ROCK
FLOOD CONTROL STORAGE VS. TIME

PLAN	YEAR	POOL ELEVATION (FEET)
1	1984	728
1	1994	733
1	2019	738
1	2044	742
2	1984	742
3	1984	736
3	1999	742
4	1984	732
4	1994	736
4	2004	742
7	1984	734
7	1999	742

ATE C-3


TOTAL STORAGE IN 10,000 ACRE-FEET
172
168
164
160
156
152
148
144
140
1984
1994
2004
2014
2024
2034
2044
TIME IN YEARS
PLAN 4

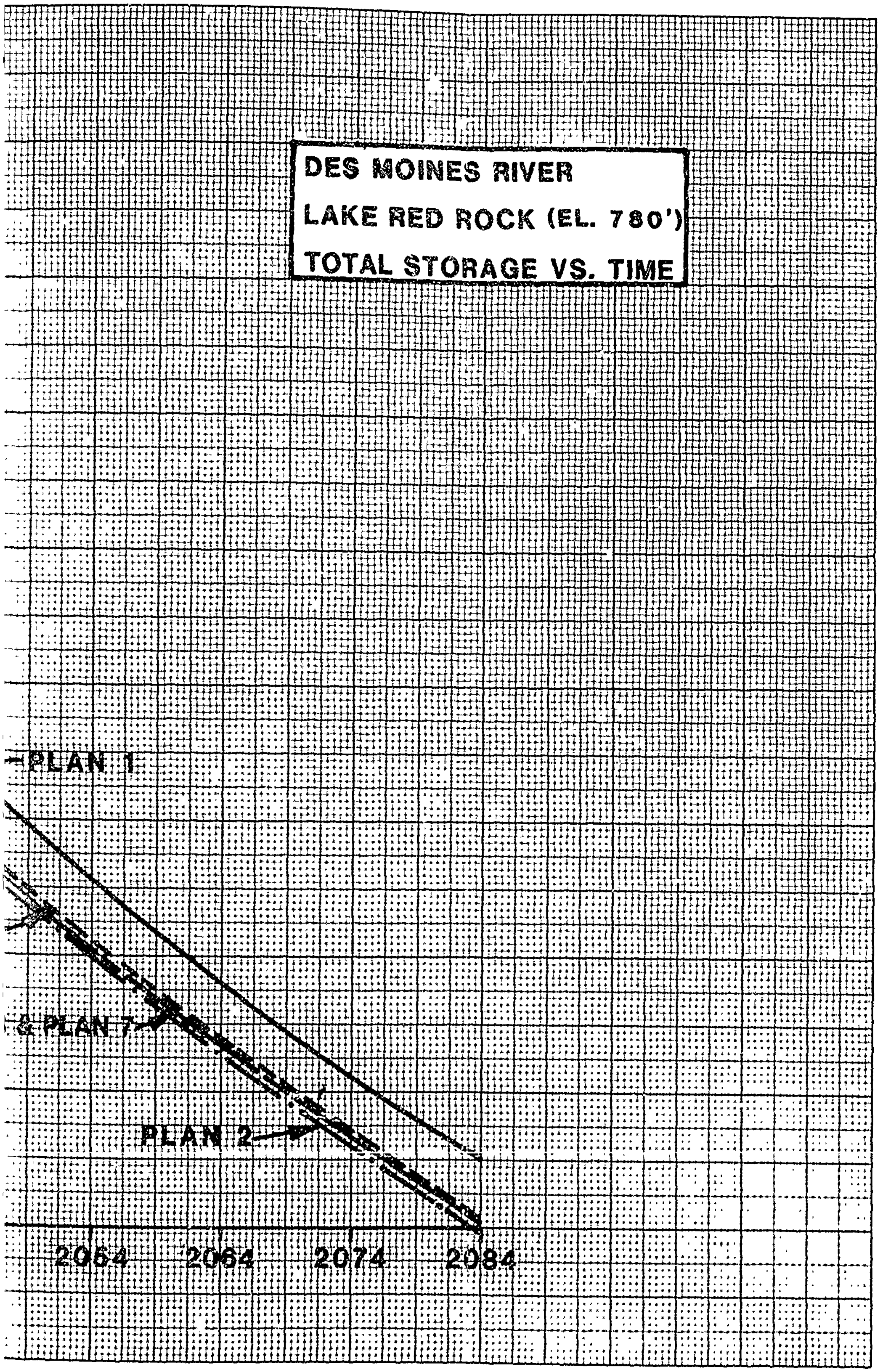

DES MOINES RIVER
LAKE RED ROCK (EL. 780')
TOTAL STORAGE VS. TIME
PLAN 1
& PLAN 7
PLAN 2
2054
2064
2074
2084

PLATE C-4

APPENDIX D

RED ROCK BACKWATER EFFECTS

APPENDIX D
RED ROCK BACKWATER EFFECTS

TABLE OF CONTENTS

List of Tables

List of Plates

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX D
RED ROCK BACKWATER EFFECTS

GENERAL

Concern has been expressed regarding the impact of the Red Rock Reservoir on flooding along the major streams which drain into the pool. When water flowing somewhat rapidly down a naturally sloping streambed empties into a generally horizontal pool of low velocity water, the surface profile does not change instantaneously from the incline to the flat. A transition zone is above the flat pool where a backwater curve develops. In this zone, the water gradually slows down and flows at a slightly deeper depth and changes gradually from the slope to the flat profile. Using computer models, backwater curves caused by the pool upstream of Red Rock Dam were computed and compared to water surface profiles computed as if Red Rock Dam were not in place. These computations are dependent on detailed topographic information which is available only for present conditions.

The length and location of the backwater changes for a given stream depending on the flow and the pool level. In order to consistently evaluate the impacts of the backwater, the 100-year discharge coincident with the full flood control pool level of 780 feet National Geodetic Vertical Datum (NGVD) was selected for this study. These assumptions provide severe conditions and result in a very conservative estimate of the highest elevation of flooding due to backwater from the Red Rock project. The 100-year discharge (that discharge that has a 1 percent chance of occurrence in any year) is the regulatory flow used by the State of Iowa in floodplain management.

STUDY DESCRIPTION

Water surface elevations were calculated using a computer program from the Hydrologic Engineering Center called "HEC-2, Water Surface Profiles." Natural stream profiles (for the condition that the reservoir is not in place) were run for the 100-year flood on the Des Moines, North, Middle, and South Rivers and Whitebreast Creek. These tributaries and the Des Moines River are the major streams which flow into the pool at Red Rock Dam as shown on plate D-1.

Reservoir profiles (for the condition that the reservoir is in place) were run using the HEC-2 program with the reservoir pool elevation at full flood control pool, or elevation 780.0 feet NGVD. Coincident profiles were computed for the 100-year flood on the Des Moines, North, Middle, and South

Rivers and Whitebreast Creek. Resulting profiles. for the with- and without-reservoir conditions, for each stream then were compared to determine where significant backwater effects exist.

INPUT DATA AND RESULTS

Information needed to use HEC-2 and calculate the desired water surface profiles include: discharges, reach lengths, cross-sectional data, energy loss coefficients, and a starting water surface elevation.

Discharges used for the Des Moines River were the discharges used i the 1985 Des Moines Flood Insurance Study which is currently under review. The Hydrologic Engineering Center's computer program "Flood Flow Frequency Analysis" was used to calculate discharges for the other rivers. United States Geological Survey (USGS) gaging stations are located on the North, Middle, and South Rivers and on Whitebreast Creek. Average daily streamflow records are available, and annual peak discharges were obtained from these records. A skew value of -0.15, as obtained from the Rock Island District Skew Study Map, was used for the tributary streams. Basic data and the resulting hydrologic analyses are shown on plates D-2 through D-6.

Cross-sectional information came from five sources: cross-section surveys done by a contractor (Shive-Hattery Engineers), sedimentation ranges surveyed by the Rock Island District, USGS topographical maps, bridge plans supplied by the State of Iowa and Marion County, and cross sections used in the Des Moines Flood Insurance Study. Plates D-7 through D-15 illustrate typical sections of the various streams.

Reach lengths (distances along the river between cross sections) were measured from USGS topographical maps and sedimentation range location maps. Sediment ranges used in this study are located approximately as shown on plate D-1.

Contraction coefficients used in the HEC-2 computer program were 0.1 for channels without bridges and 0.3 for channels with bridges. Expansion coefficients used were 0.3 for channels without bridges and 0.5 for channels with bridges. N-values were estimated from photographs taken by the contractor and by Rock Island District Hydraulics Branch personnel during site visits in the fall of 1985. N-values ranged from 0.015 to 0.04 for the channel and 0.035 to 0.110 for the overbanks.

Starting water surface elevations were determined by using the slope area method when calculating natural stream profiles. When calculating water surface profiles with the reservoir in place, the starting water surface elevation was 780.0 feet NGVD, or full flood control pool elevation.

Results of the backwater computations are shown in tabular form in table D-1. The State of Iowa considers the alteration of a flood profile of 1 foot or more to be significant.

TABLE D-1

Results of Backwater Computations

River	Drainage Area at Gaging Station (mi^2)	100-Yr. Discharge (ft^3/s)	Elevation of Highest Significant Backwater Effect
Des Moines River	9,879	63,900	782.0
Whitebreast Creek	342	26,300	785.0
South River	460	38,000	781.6
Middle River	503	23,600	781.6
North River	349	23,200	780.3

DES MOINES RIVER

The 100-year discharge, as obtained from the Des Moines Flood Insurance Study, is 63,900 cubic feet per second (ft^3/s). N-values used ranged from 0.015 to 0.035 for the channel and 0.035 to 0.110 for the overbanks.

Computations indicate that the 100-year coincident flood event has 1 foot or more of backwater effect until elevation 781.0 feet NGVD is reached by the natural water surface profile. This is illustrated on plate D-16 which shows the computed water surface profiles.

WHITEBREAST CREEK

Discharges were developed using the Flood Flow Frequency Analysis computer program. The USGS gaging station on Whitebreast Creek was located near Knoxville, Iowa (drainage area = 380 square miles (mi^2)) from 1946 to 1962. The gage then was moved near Dallas, Iowa (drainage area = 342 mi^2), and streamflow records are available there from 1962 to 1983. The Knoxville record was adjusted for the difference in the two drainage areas and was merged with the Dallas record. The flow frequency analysis indicates a 100-year discharge of 26,300 ft^3/s. Cross-sectional geometry was taken from USGS topographical maps and bridge plans provided by the State of Iowa and Marion County. N-values used ranged from 0.02 to 0.035 for channel sections and 0.07 to 0.09 for overbanks.

Computations indicate that the 100-year coincident flood event profile is 1 foot or more over the natural profile until elevation 784 feet NGVD is reached by the natural water surface profile. This is illustrated on plate D-17 which shows the computed water surface profiles.

SOUTH RIVER

Discharges were developed using the Flood Flow Frequency Analysis computer program. The USGS gaging station on the South River is located near Ackworth, Iowa (drainage area = 460 mi^2), and streamflow records are available from 1940 to 1983, with some historical data available for the 1930 flood. The flow frequency analysis indicates a 100-year discharge of 38,000 ft^3/s. Cross sections used include surveys done by the contractor and sedimentation ranges. N-values selected range from 0.02 to 0.035 for the channel and 0.065 to 0.08 for the overbanks.

Computations indicate that the 100-year coincident flood event has 1 foot or more of backwater effect until elevation 780.6 feet NGVD is reached by the natural water surface profile. This is illustrated on plate D-18 which shows the computed water surface profiles.

MIDDLE RIVER

Discharges were developed using the Flood Flow Frequency Analysis computer program. The USGS gaging station on the Middle River is located near Indianola, Iowa (drainage area = 503 mi^2), and streamflow records are available from 1940 to 1983. The flow frequency analysis indicates a 100-year discharge of 23,600 ft^3/s. Cross sections used include surveys done by the contractor along with sedimentation ranges. N-values selected ranged from 0.02 to 0.035 for the channel and 0.055 to 0.075 for the overbanks.

Computations indicate that the 100-year coincident flood event reservoir profile is 1 foot over the natural profile until elevation 780.6 feet NGVD is reached by the natural profile. This is illustrated on plate D-19 which shows the computed water surface profiles.

NORTH RIVER

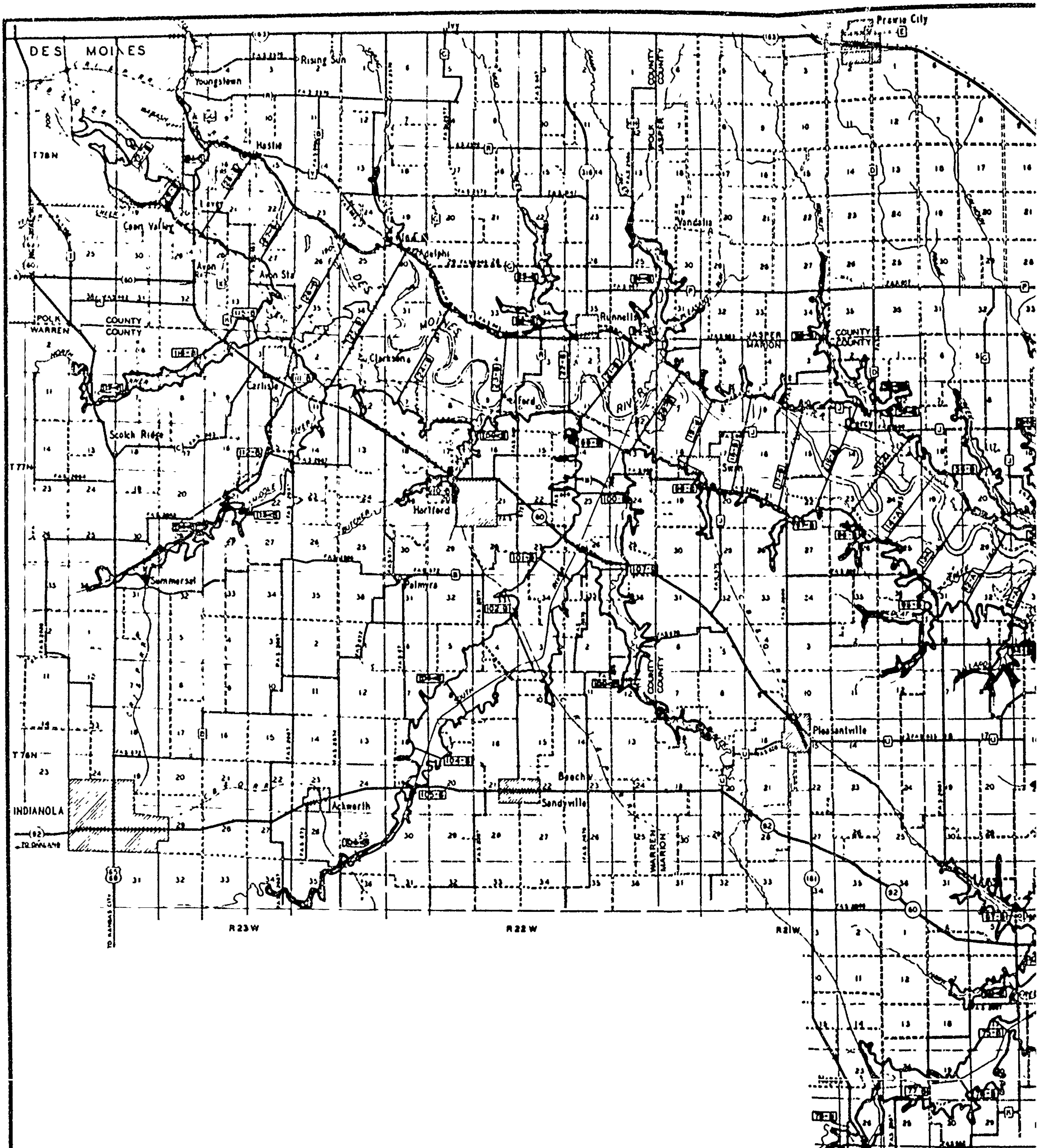
Discharges were developed using the Flood Flow Frequency Analysis computer program. The USGS gag'-g station on the North River is located near Norwalk, Iowa (drainage area = 349 mi^2), and streamflow records are available from 1940 to 1983. The flow frequency analysis indicates a 100-year discharge of 23,200 ft^3/s. Cross sections used include surveys done by the contractor, along with sedimentation ranges. N-values selected ranged from 0.02 to 0.04 for the channel and 0.05 to 0.07 for the overbanks.

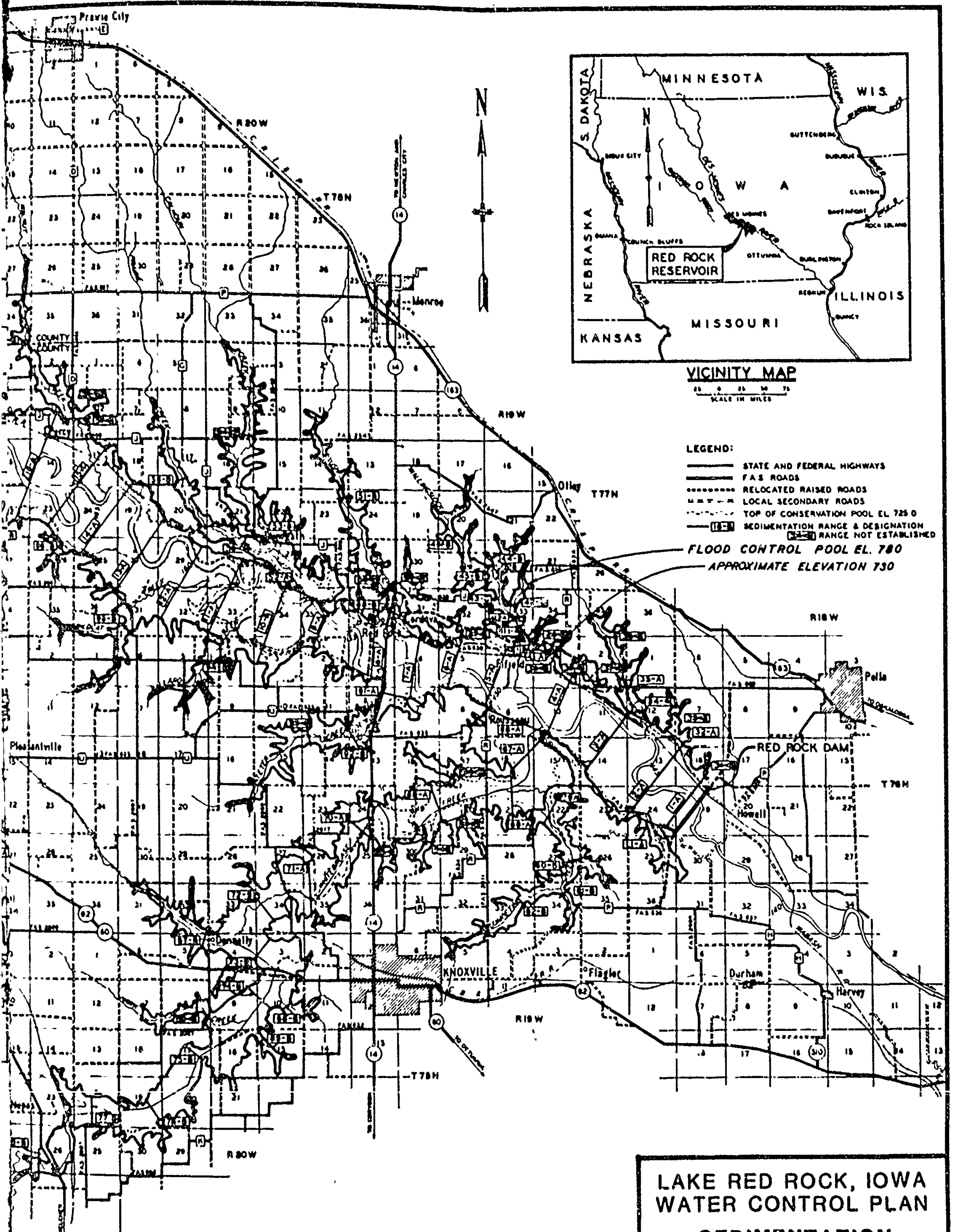
Computations indicate that for the 100-year coincident flood event a 1-foot or more backwater effect due to the reservoir exists until elevation 779.3 feet NGVD is reached by the natural water surface profile. Plate D-20 is a plot of the computed profiles.

FINDINGS

This study indicates that backwater can influence flooding above the full pool level at 780 feet NGVD. However, flowage easements were obtained up to elevation 783 feet NGVD. As discussed previously, the backwater impacts are dependent on the flow and the pool level. Based on the analysis and assumptions discussed previously, it is concluded that existing easements for all stream tributaries to the Red Rock Pool are adequate. Based on the extremely conservative assumptions of this study, existing easements are adequate for all the streams except Whitebreast Creek. However, this is not to say that the existing easements for Whitebreast Creek are inadequate. A more detailed analysis, not based on the assumption of peak flows coincident with the peak pool elevation of 780 feet NGVD, would result in a reduction in the Whitebreast Creek flow and/or the pool level. Therefore, the maximum backwater elevation reached could be significantly lower.

This analysis provides no basis of comparison for the alternative plans to raise the conservation pool level. However, the upper limit of backwater effects is established. No significant impacts for any of the planned conservation pool levels on the maximum elevation reached by backwater effects are expected.


DES MOINES
Prairie City
Ivy
Rising Sun
Youngstown
Hastie
Coon Valley
Avon
Avon Sta
Adelphi
Vandalia
Runnells
POLK COUNTY
WARREN COUNTY
JASPER COUNTY
MARION COUNTY
T78N
T77N
T76N
Clarkson
Carlisle
Scotch Ridge
Hartford
Percy
Swan
Summerset
Palmyra
Pleasantville
Beechy
Sandyville
Ackworth
INDIANOLA
R23W
R22W
R21W



LAKE RED ROCK, IOWA
WATER CONTROL PLAN
SEDIMENTATION RANGES

PLATE D-1

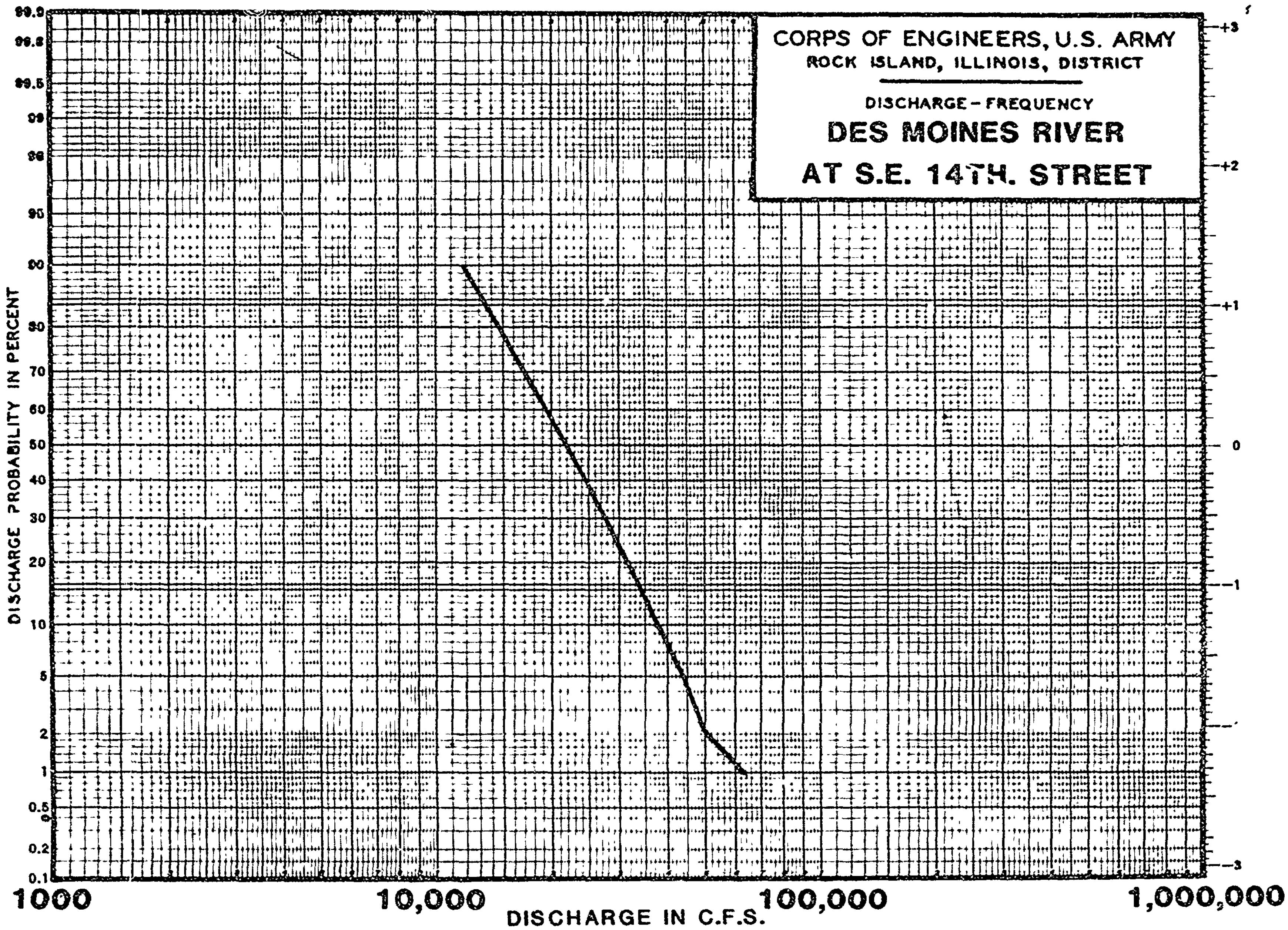

CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
DES MOINES RIVER
AT S.E. 14TH. STREET
DISCHARGE PROBABILITY IN PERCENT
99.9
99.8
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
+3
+2
+1
0
-1
-3
1000
10,000
100,000
1,000,000
DISCHARGE IN C.F.S.

PLATE D-2

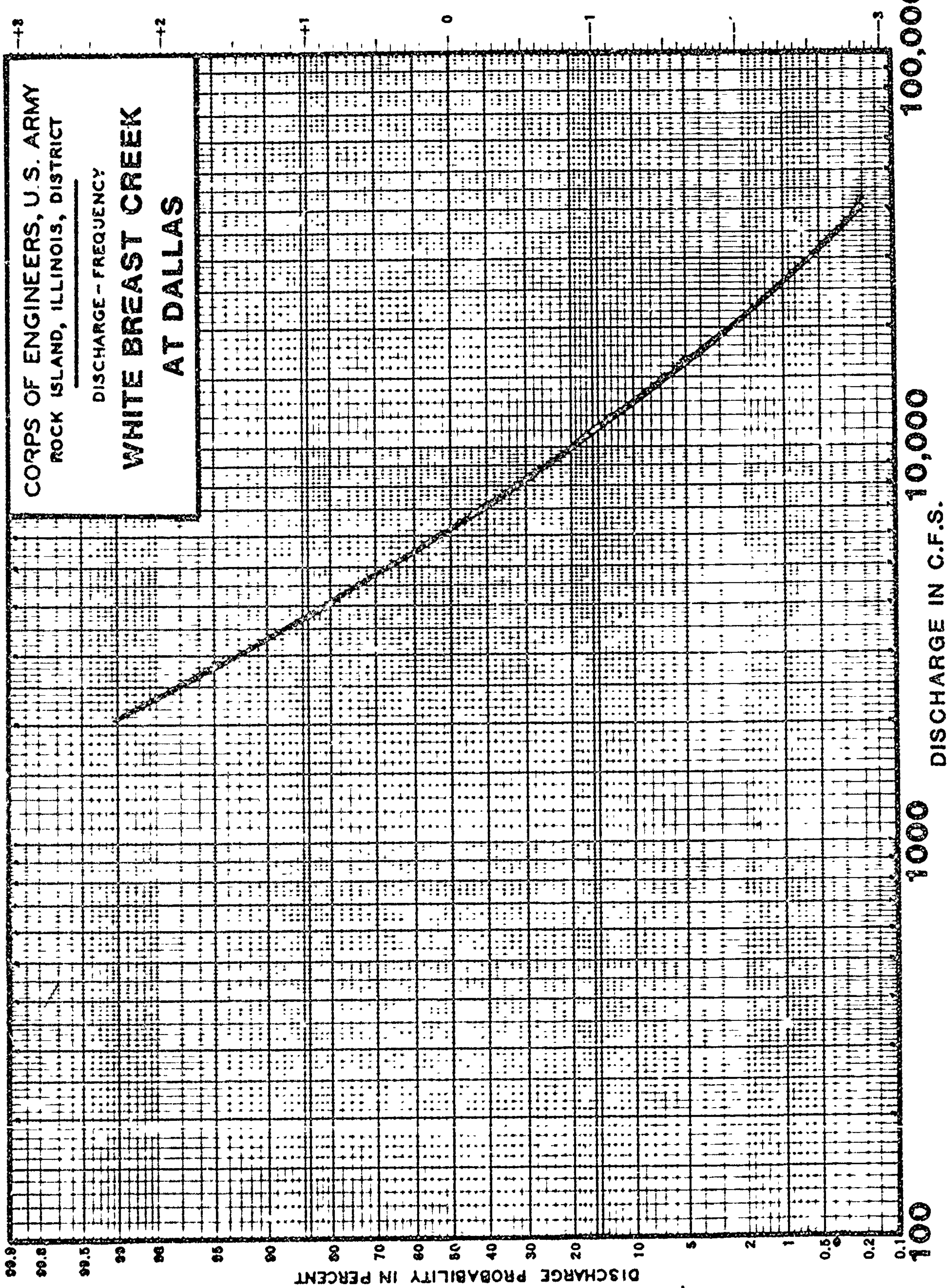
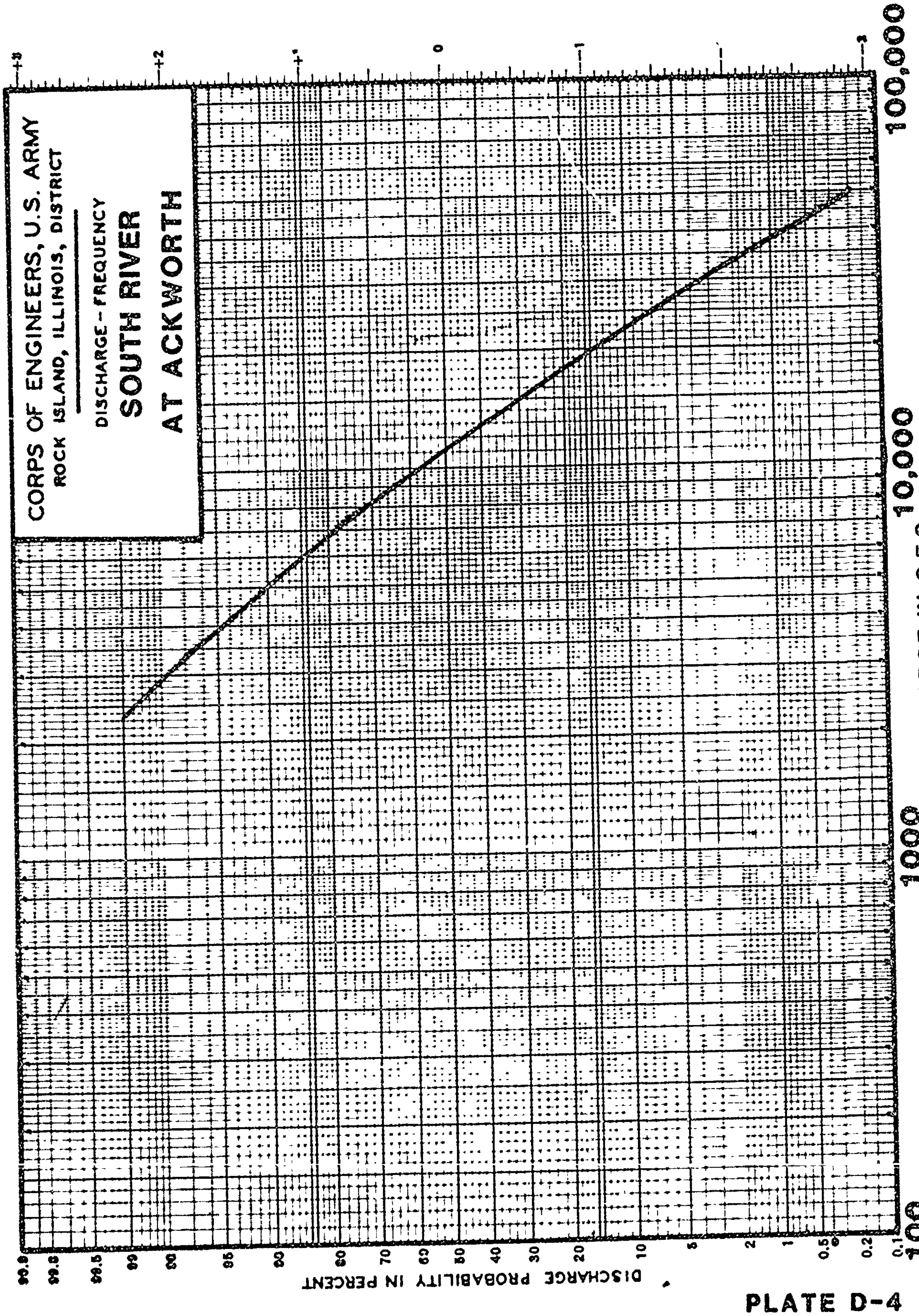

CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
WHITE BREAST CREEK
AT DALLAS
DISCHARGE IN C.F.S.
100
1000
10,000
100,000
DISCHARGE PROBABILITY IN PERCENT
99.9
99.8
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
+3
+2
+1
0
-3

PLATE D-3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ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
SOUTH RIVER
AT ACKWORTH
DISCHARGE IN C.F.S.
100
1000
10,000
100,000
DISCHARGE PROBABILITY IN PERCENT
99.9
99.8
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
+3
+2
+1
0
-1
-3

PLATE D-4

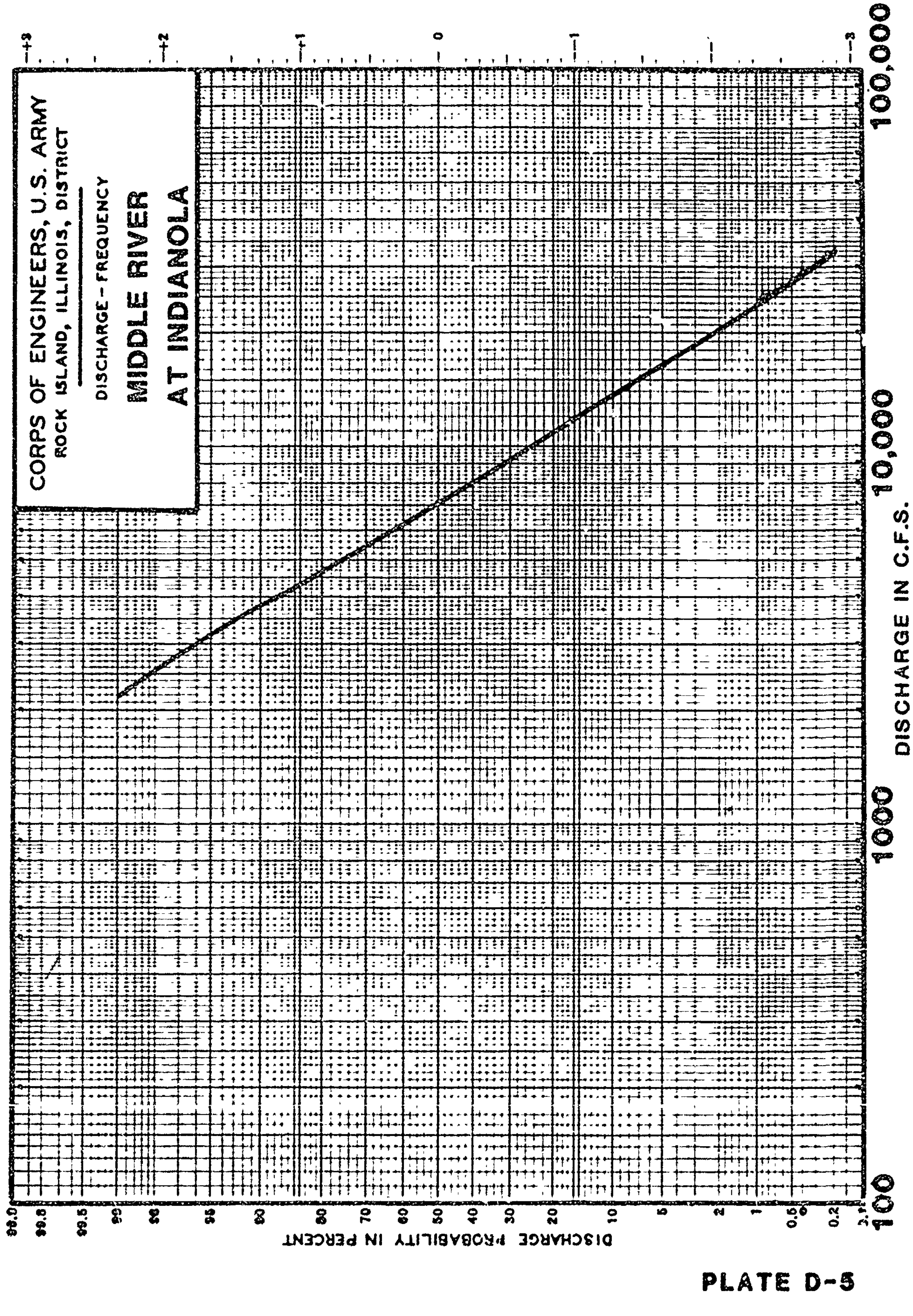

CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
MIDDLE RIVER
AT INDIANOLA
DISCHARGE IN C.F.S.
100
1000
10,000
100,000
DISCHARGE PROBABILITY IN PERCENT

PLATE D-5

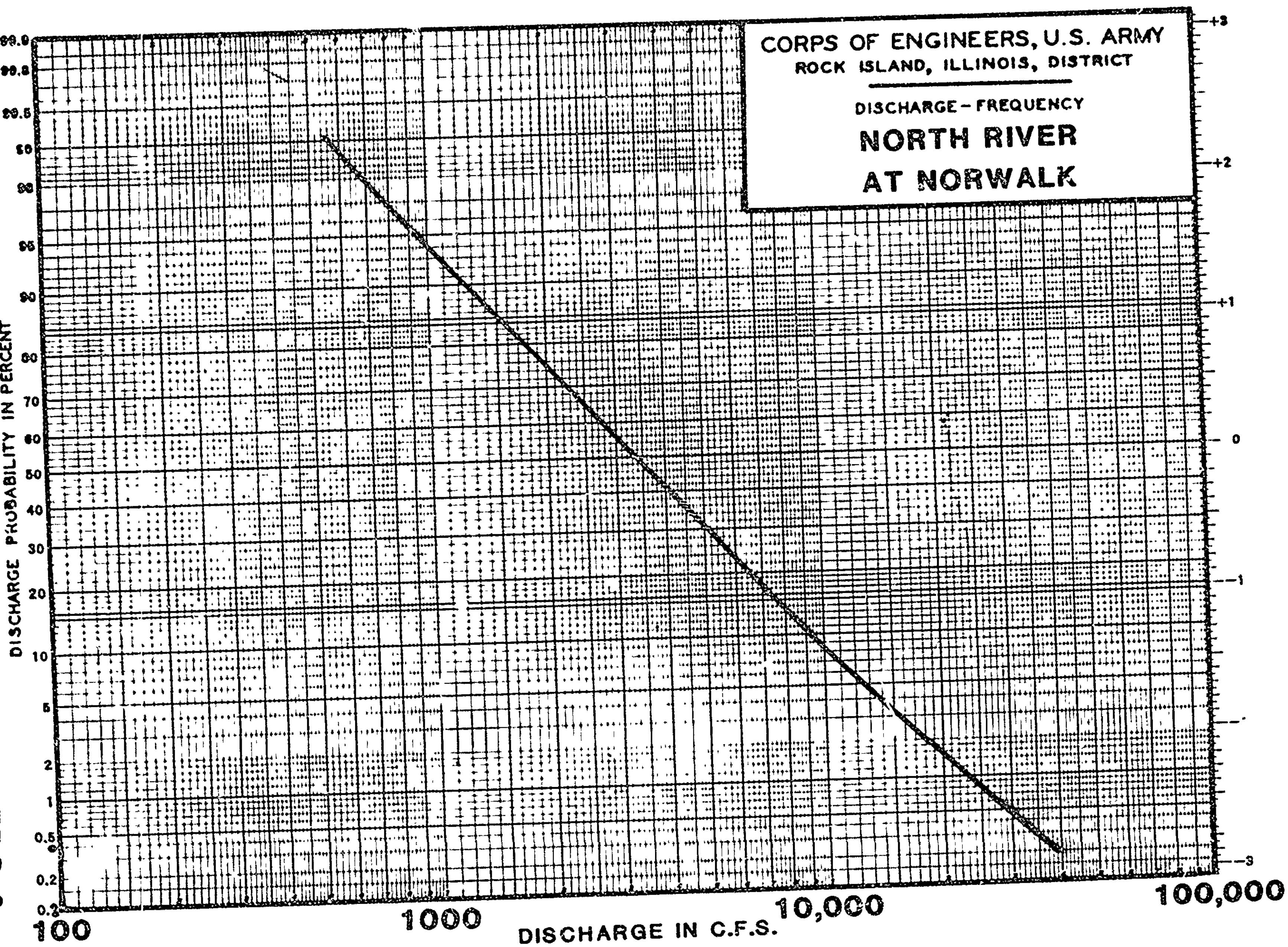

CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS, DISTRICT
DISCHARGE - FREQUENCY
NORTH RIVER
AT NORWALK
DISCHARGE PROBABILITY IN PERCENT
99.9
99.8
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.2
+3
+2
+1
0
-1
-3
100
1000
10,000
100,000
DISCHARGE IN C.F.S.

PLATE D-6

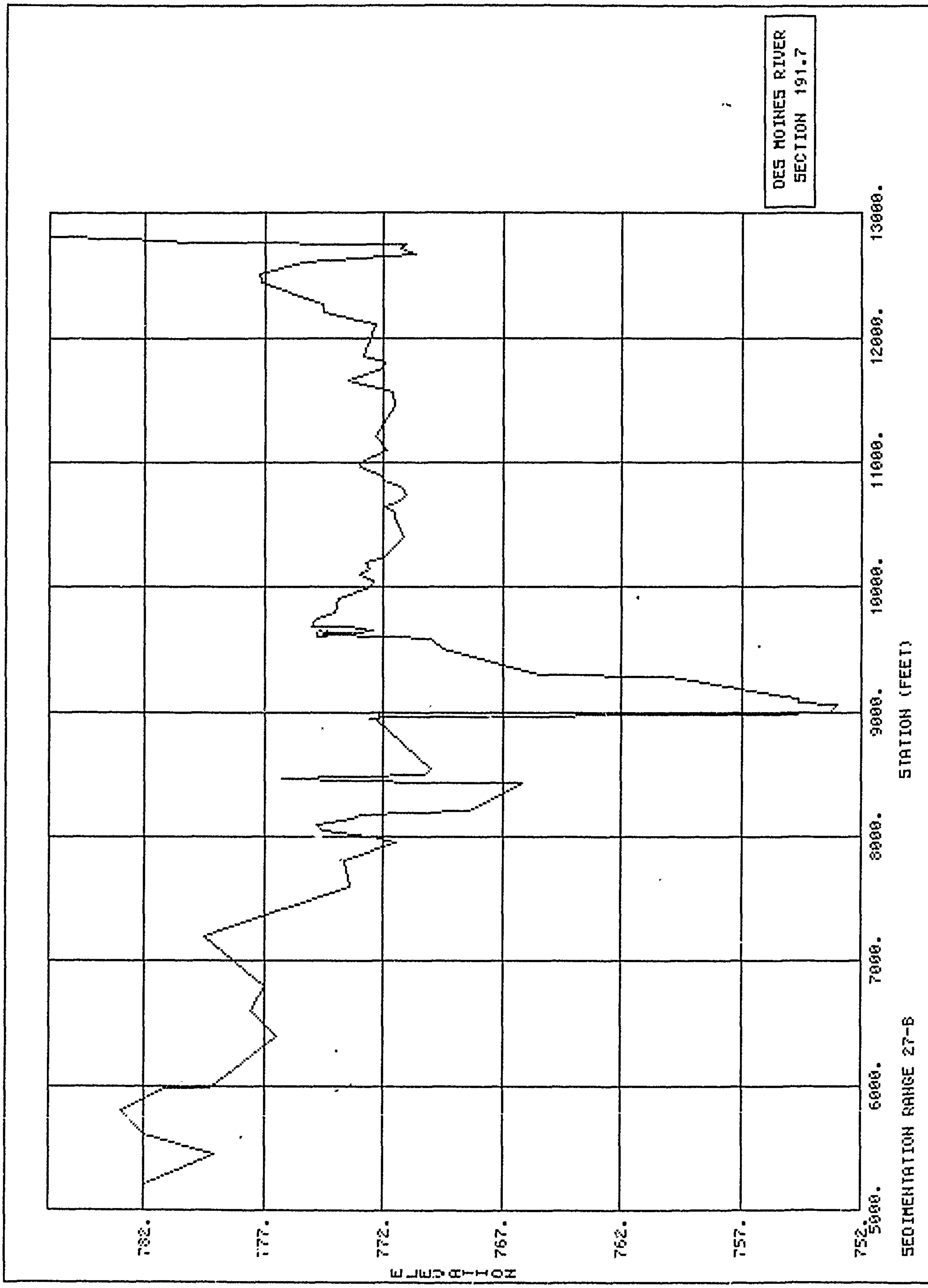

DES MOINES RIVER
SECTION 191.7
SEDIMENTATION RANGE 27-B
STATION (FEET)
ELEVATION
5000.
6000.
7000.
8000.
9000.
10000.
11000.
12000.
13000.
752.
757.
762.
767.
772.
777.
782.

PLATE D-7

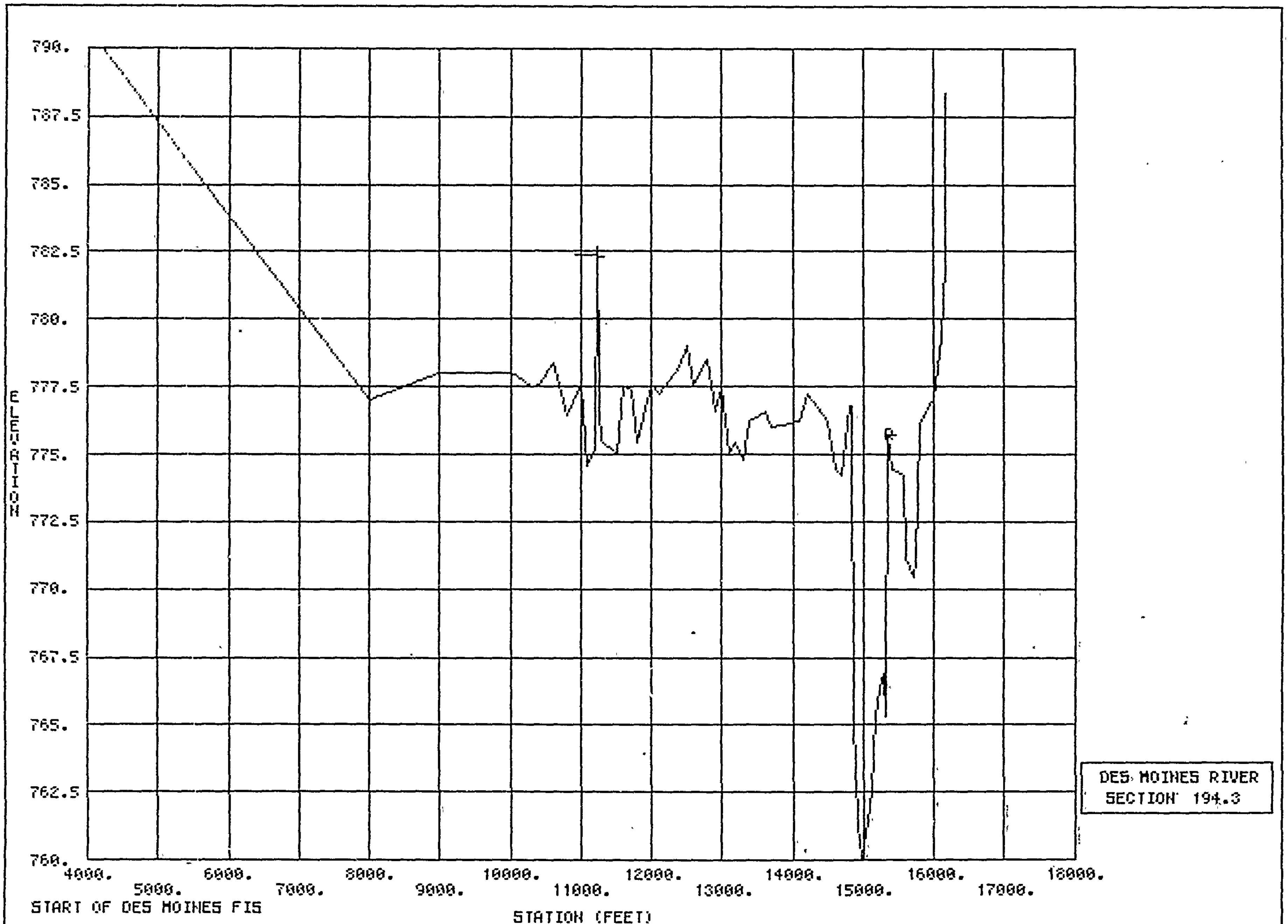

DES MOINES RIVER
SECTION 194.3
ELEVATION
790.
787.5
785.
782.5
780.
777.5
775.
772.5
770.
767.5
765.
762.5
760.
4000.
5000.
6000.
7000.
8000.
9000.
10000.
11000.
12000.
13000.
14000.
15000.
16000.
17000.
18000.
START OF DES MOINES FIS
STATION (FEET)

PLATE D-8

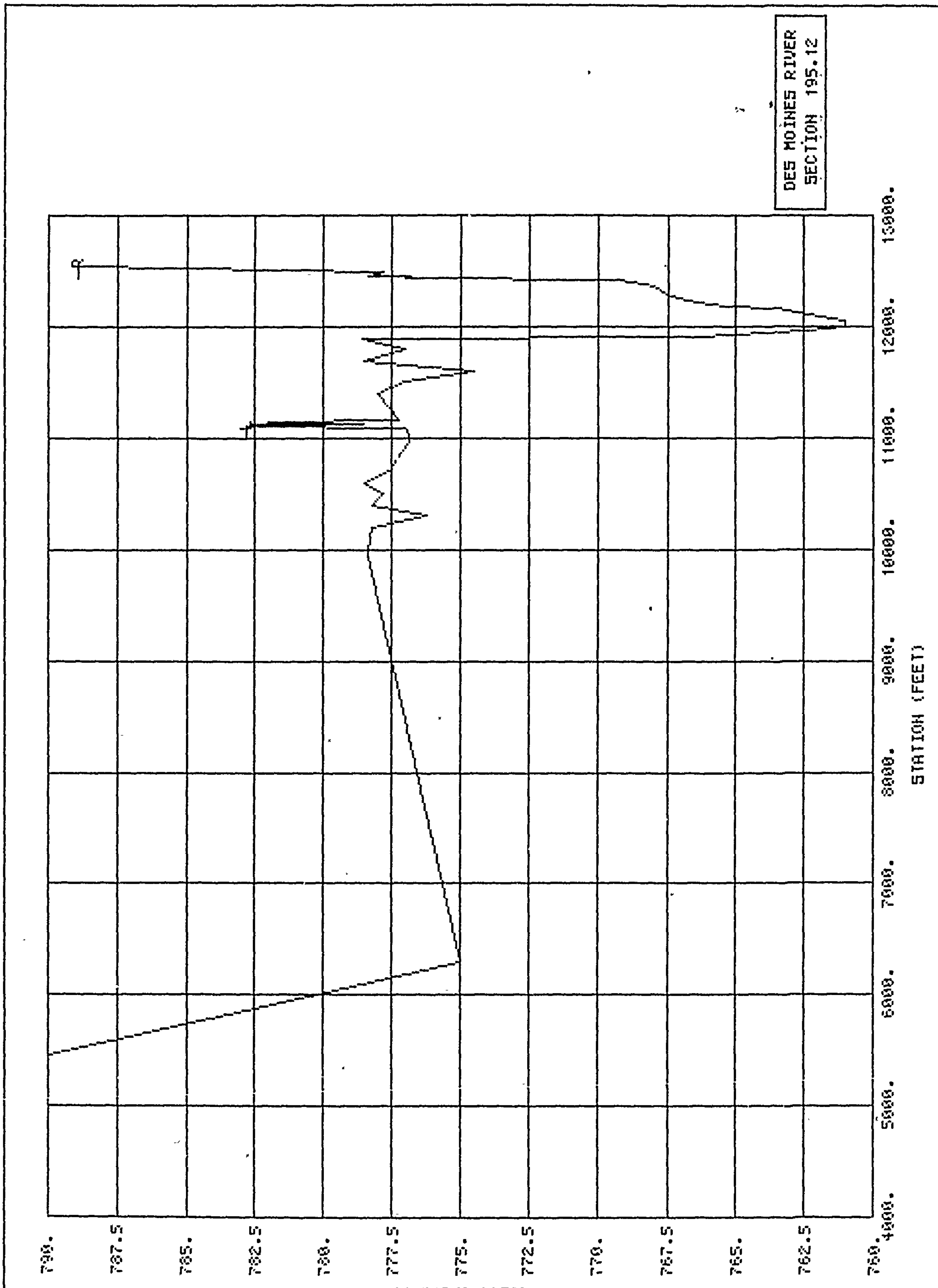

DES MOINES RIVER
SECTION 195.12
STATION (FEET)
ELEVATION
4000.
5000.
6000.
7000.
8000.
9000.
10000.
11000.
12000.
13000.
760.
762.5
765.
767.5
770.
772.5
775.
777.5
780.
782.5
785.
787.5
790.

PLATE D-9

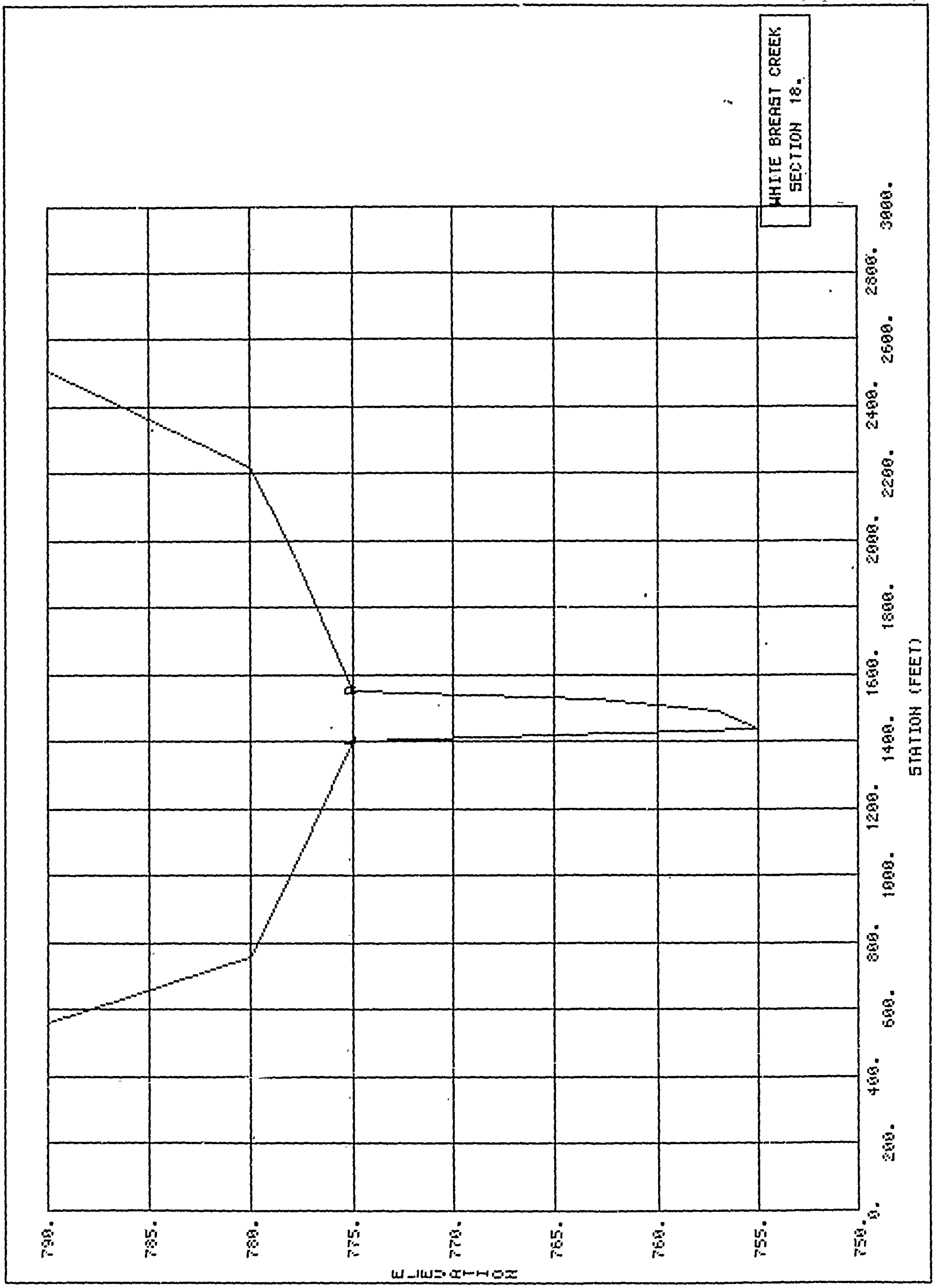

WHITE BREAST CREEK
SECTION 18.
STATION (FEET)
ELEVATION
0.
200.
400.
600.
800.
1000.
1200.
1400.
1600.
1800.
2000.
2200.
2400.
2600.
2800.
3000.
750.
755.
760.
765.
770.
775.
780.
785.
790.

PLATE D-10

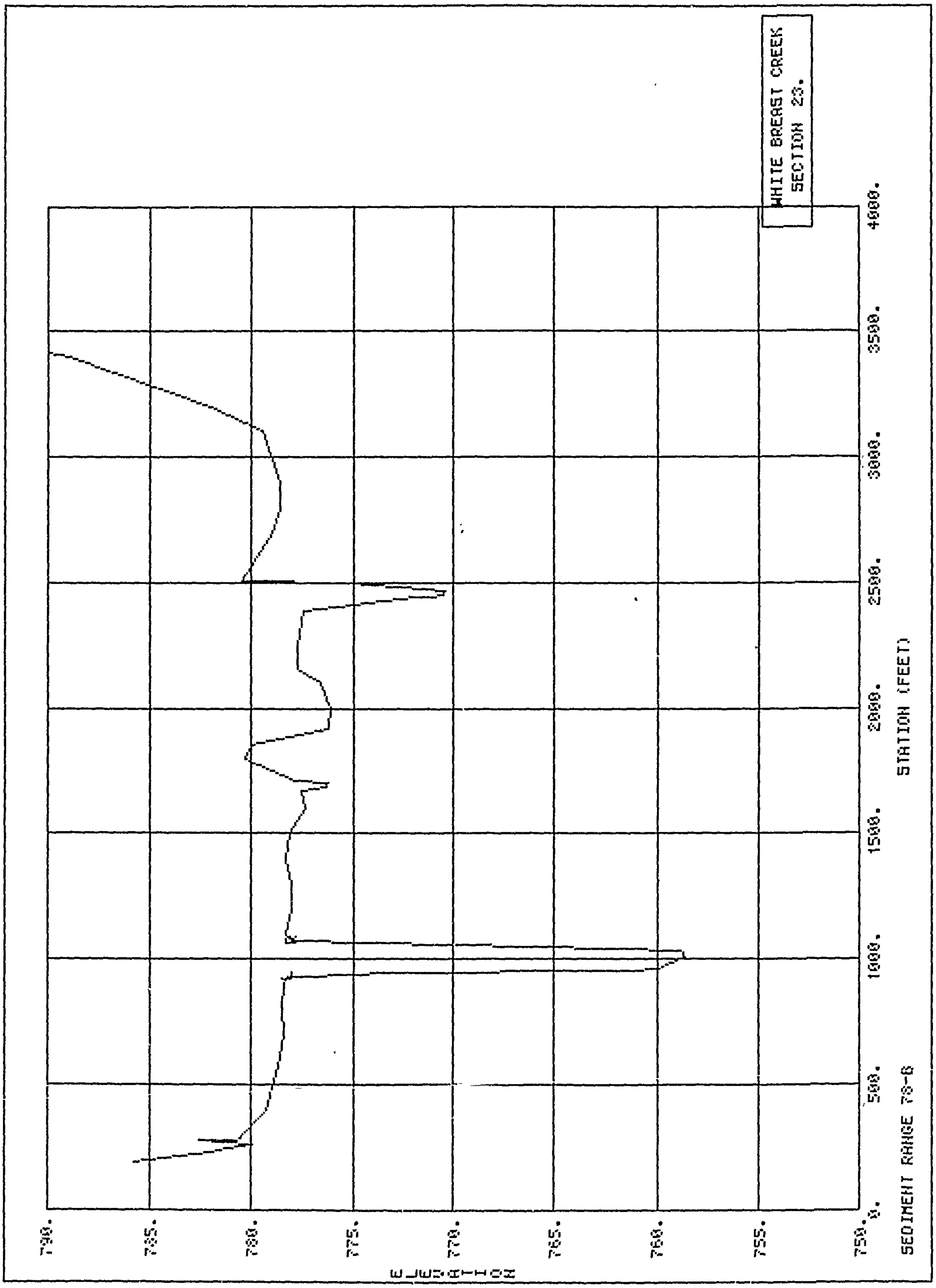

WHITE BREAST CREEK
SECTION 23.
790.
785.
780.
775.
770.
765.
760.
755.
750.
ELEVATION
0.
500.
1000.
1500.
2000.
2500.
3000.
3500.
4000.
STATION (FEET)
SEDIMENT RANGE 78-6

PLATE D-11

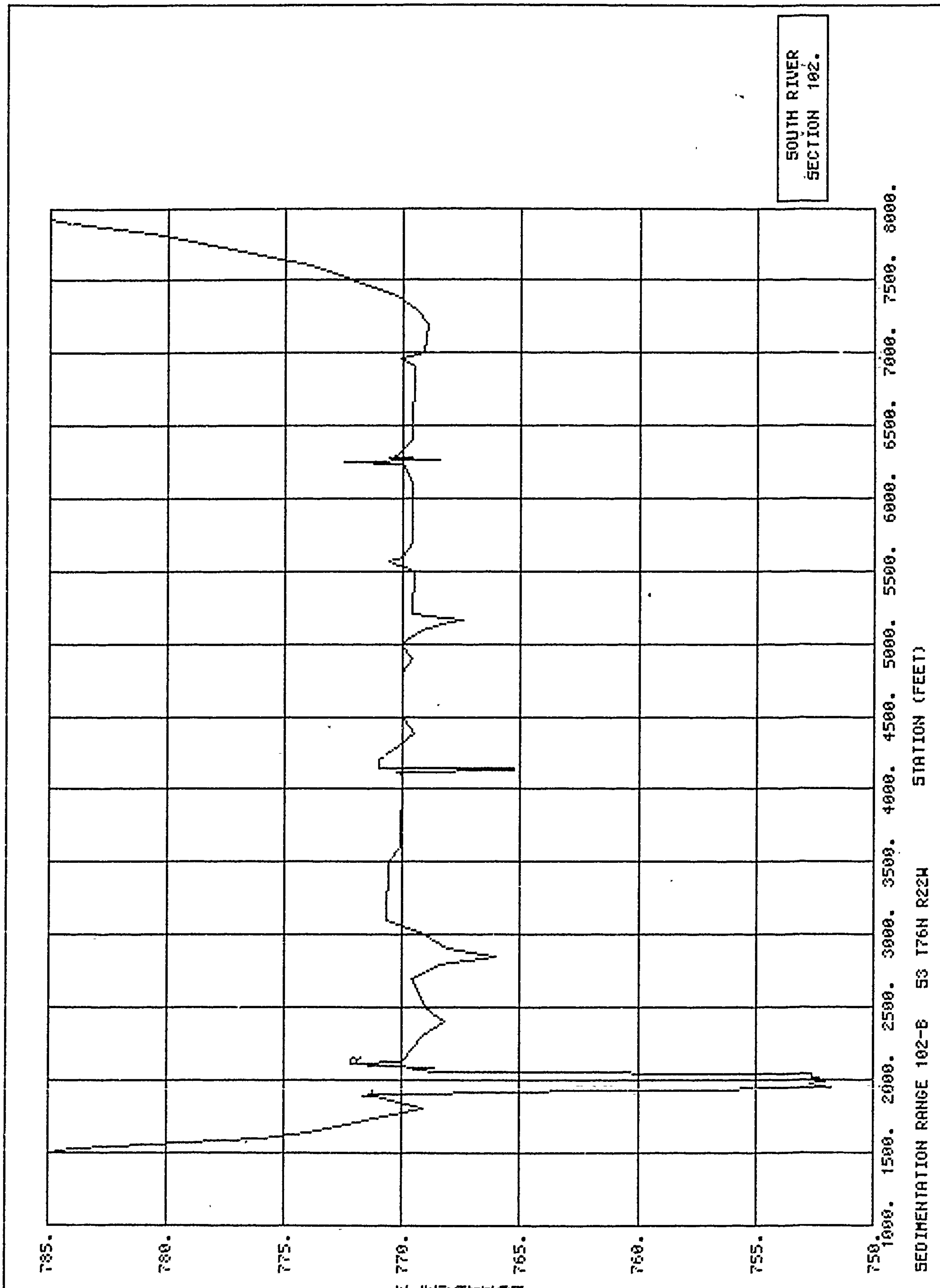

SOUTH RIVER
SECTION 102.
785.
780.
775.
770.
765.
760.
755.
750.
ELEVATION
1000.
1500.
2000.
2500.
3000.
3500.
4000.
4500.
5000.
5500.
6000.
6500.
7000.
7500.
8000.
STATION (FEET)
SEDIMENTATION RANGE 102-B S3 T76N R22W

PLATE D-12

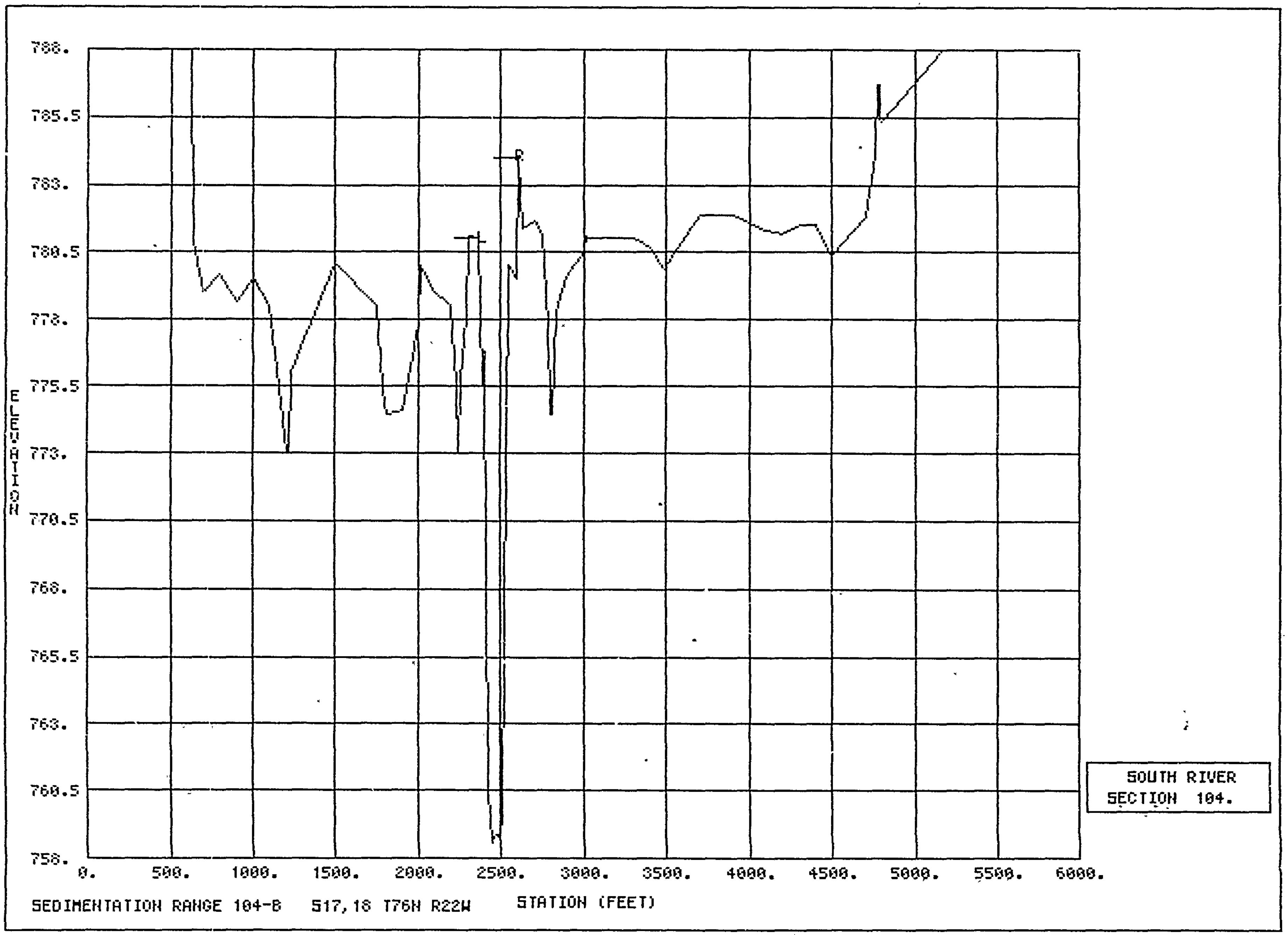

788.
785.5
783.
780.5
778.
775.5
773.
770.5
768.
765.5
763.
760.5
758.
ELEVATION
0.
500.
1000.
1500.
2000.
2500.
3000.
3500.
4000.
4500.
5000.
5500.
6000.
SEDIMENTATION RANGE 104-B 517,18 T76N R22W
STATION (FEET)
SOUTH RIVER
SECTION 104.

PLATE D-13

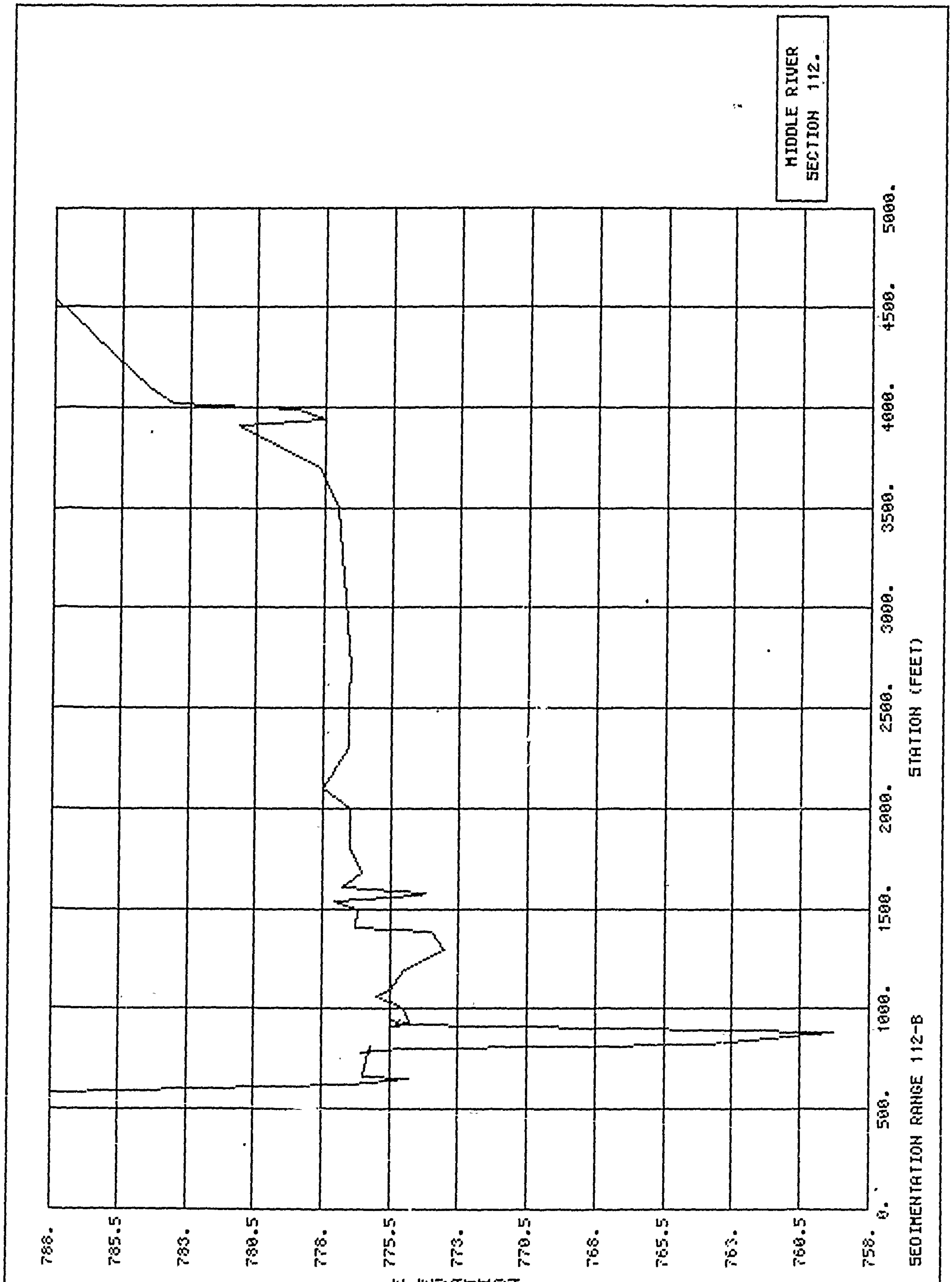

MIDDLE RIVER
SECTION 112.
788.
785.5
783.
780.5
778.
775.5
773.
770.5
768.
765.5
763.
760.5
758.
ELEVATION
0.
500.
1000.
1500.
2000.
2500.
3000.
3500.
4000.
4500.
5000.
SEDIMENTATION RANGE 112-B
STATION (FEET)

PLATE D-14

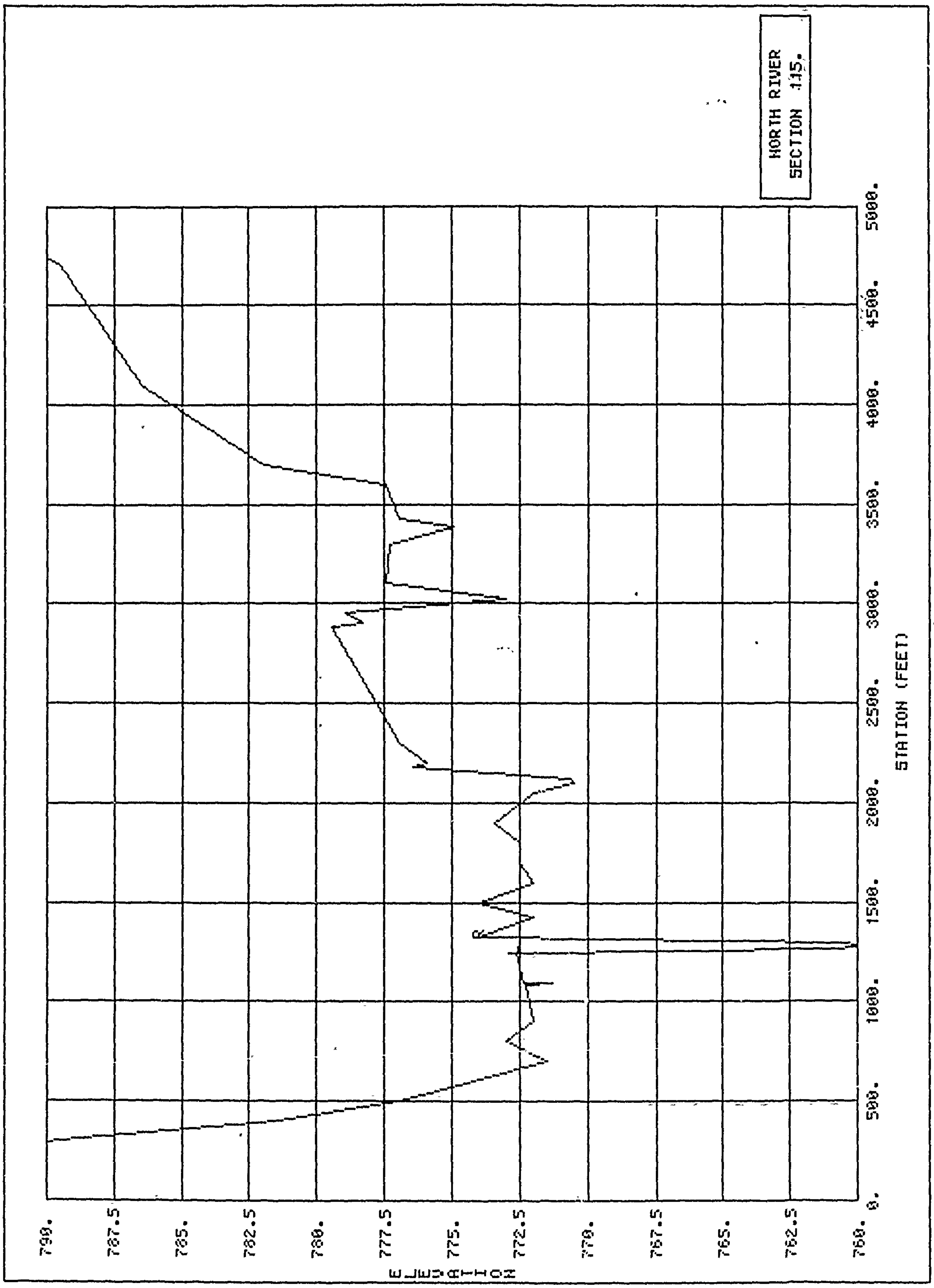
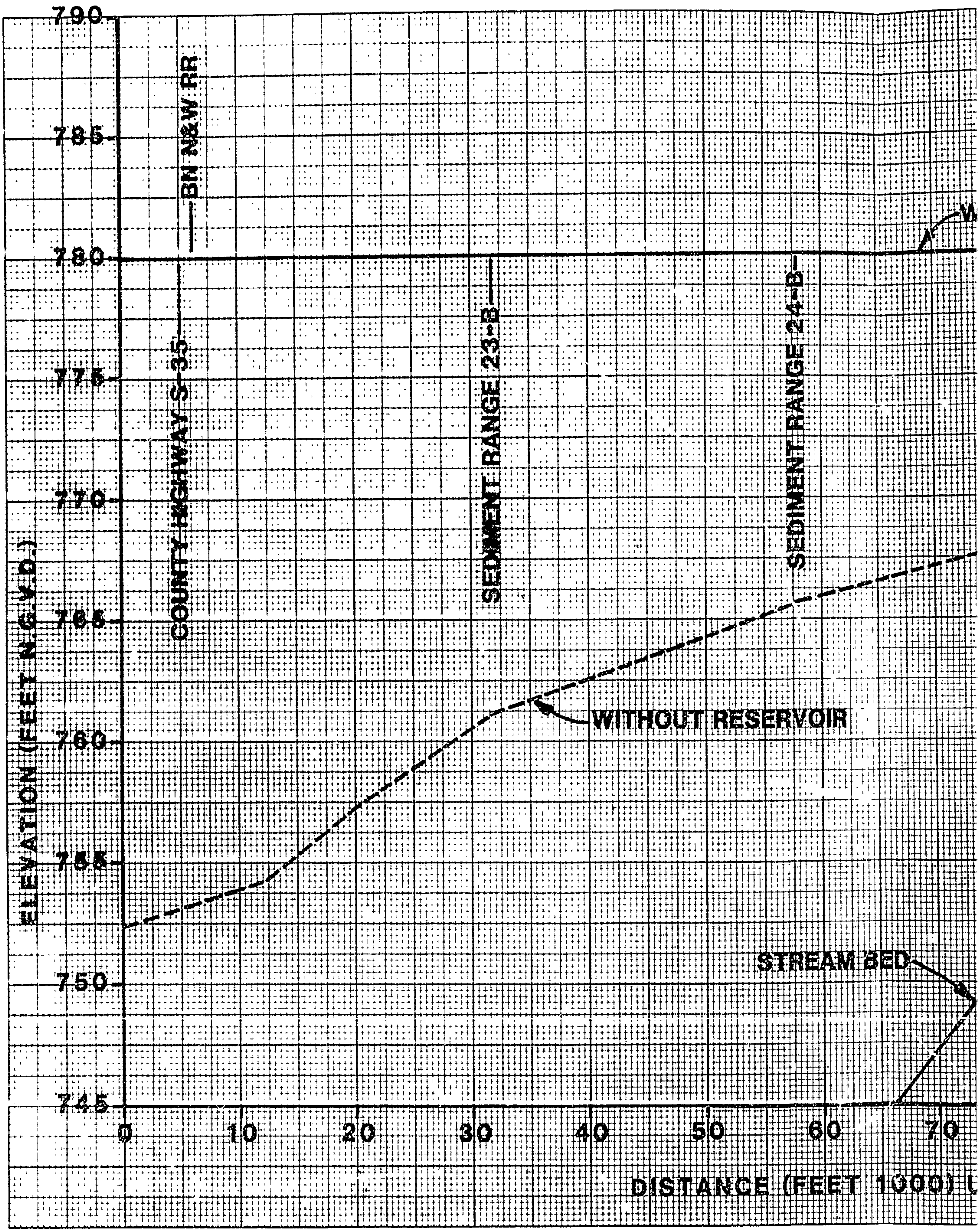

NORTH RIVER
SECTION 115.
ELEVATION
790.
787.5
785.
782.5
780.
777.5
775.
772.5
770.
767.5
765.
762.5
760.
STATION (FEET)
0.
500.
1000.
1500.
2000.
2500.
3000.
3500.
4000.
4500.
5000.

PLATE D-15



790
785
780
775
770
765
760
755
750
745
BM N&W RR
COUNTY HIGHWAY S-35
SEDIMENT RANGE 23-B
SEDIMENT RANGE 24-B
WITHOUT RESERVOIR
STREAM BED
0
10
20
30
40
50
60
70
ELEVATION (FEET N.G.V.D.)
DISTANCE (FEET 1000)

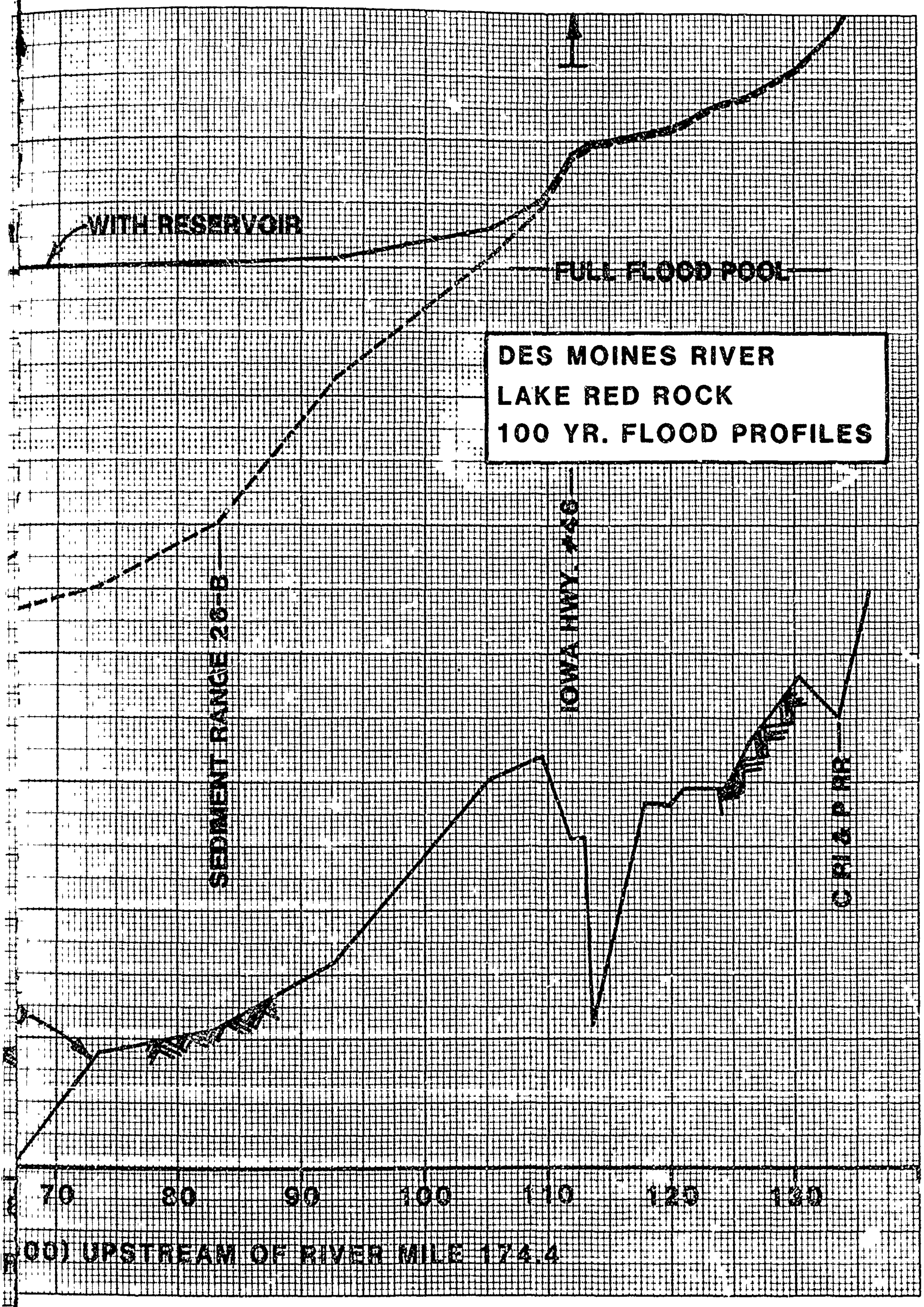
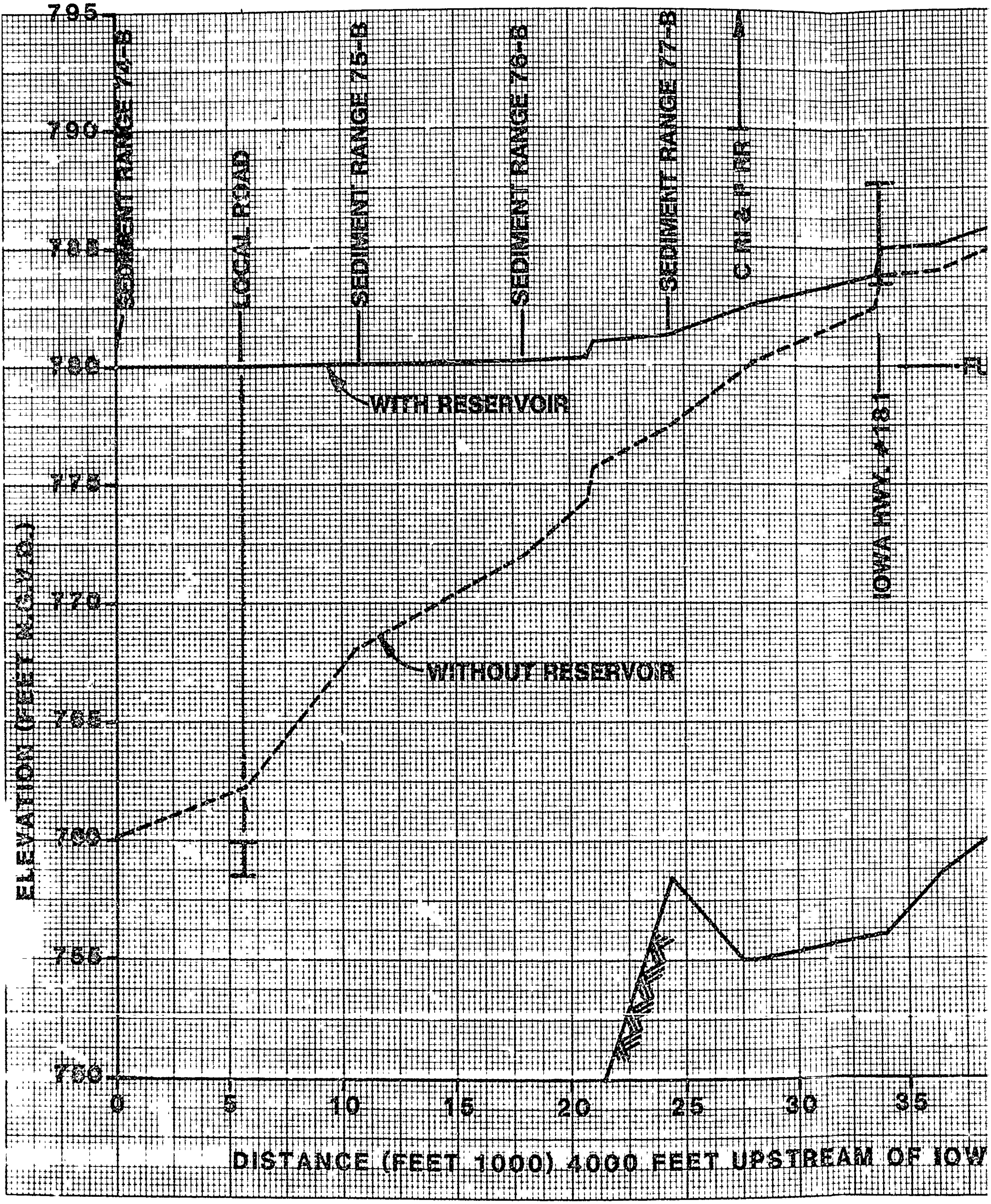
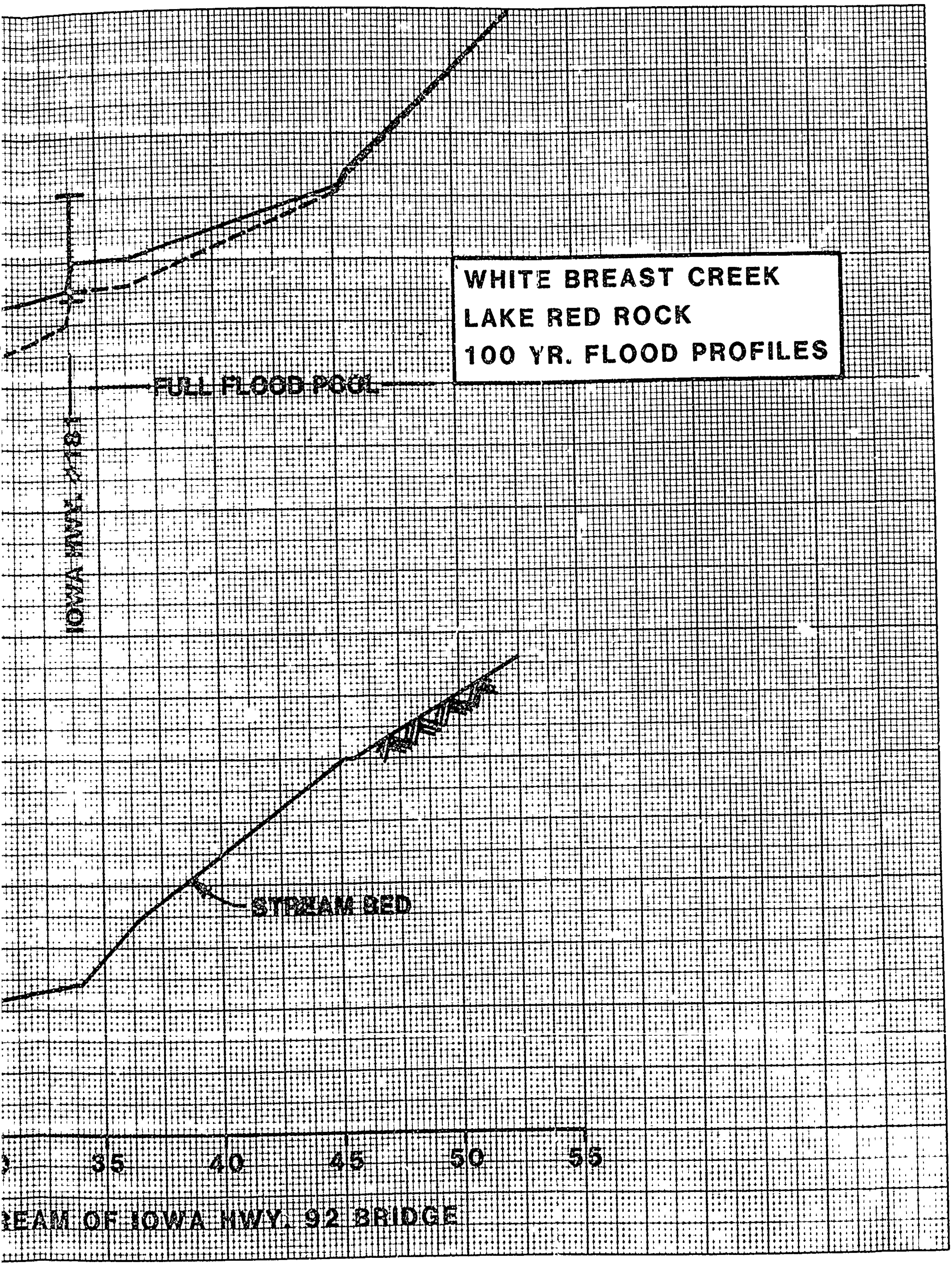
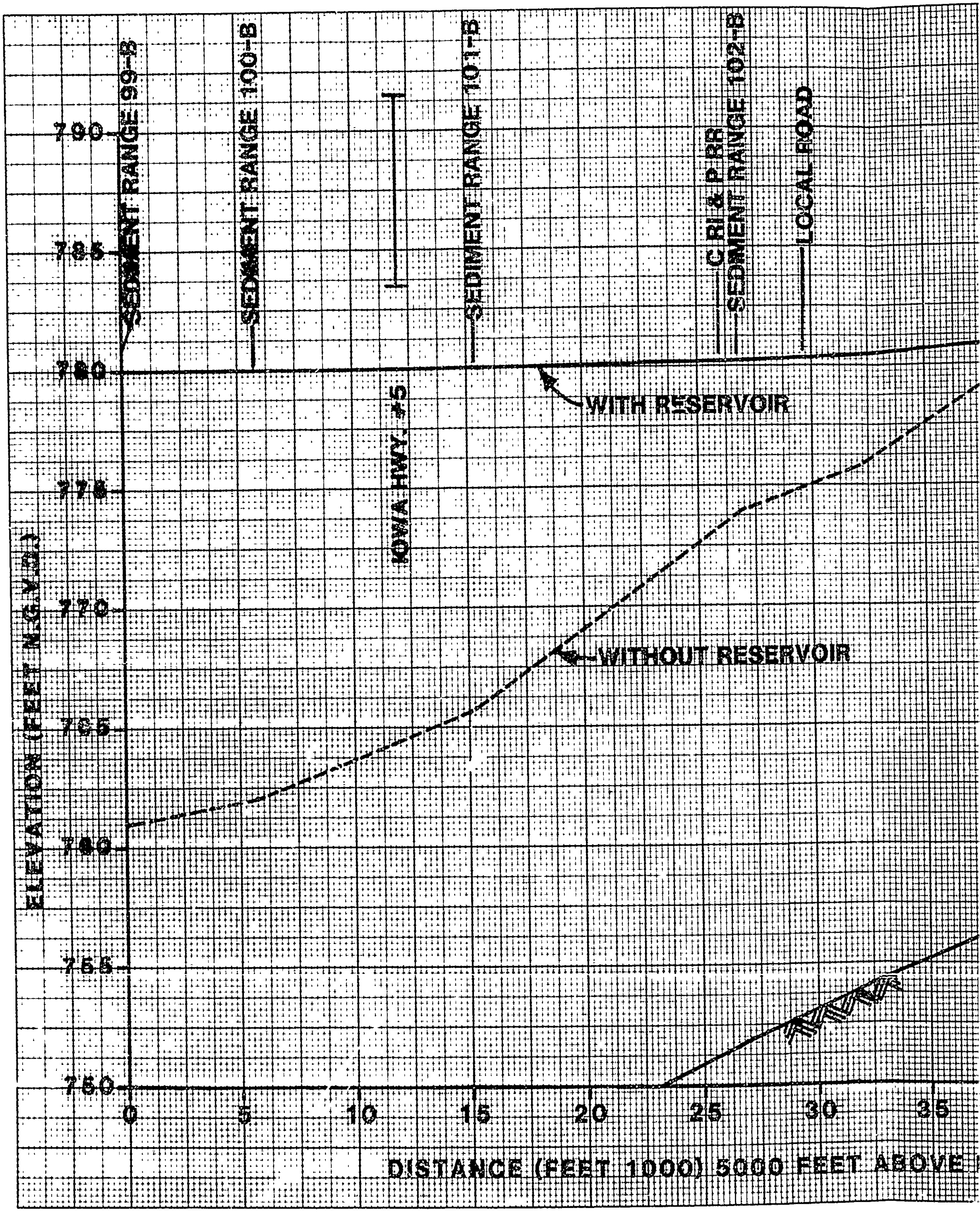

WITH RESERVOIR
FULL FLOOD POOL
DES MOINES RIVER
LAKE RED ROCK
100 YR. FLOOD PROFILES
SEDIMENT RANGE 26-B
IOWA HWY. #46
C RI & P RR
70
80
90
100
110
120
130
00) UPSTREAM OF RIVER MILE 174.4

PLATE D-16


795
790
SEDIMENT RANGE 74-B
LOCAL ROAD
SEDIMENT RANGE 75-B
SEDIMENT RANGE 76-B
SEDIMENT RANGE 77-B
C RI & P RR
IOWA HWY. #181
WITH RESERVOIR
WITHOUT RESERVOIR
ELEVATION (FEET
0
5
10
15
20
25
30
35
DISTANCE (FEET 1000) 4000 FEET UPSTREAM OF IOW


WHITE BREAST CREEK
LAKE RED ROCK
100 YR. FLOOD PROFILES
FULL FLOOD POOL
IOWA HWY. 18
STREAM BED
35
40
45
50
55
EAM OF IOWA HWY. 92 BRIDGE



ELEVATION (FEET N.G.V.D.)
790
785
780
775
770
765
760
755
750
SEDIMENT RANGE 99-B
SEDIMENT RANGE 100-B
SEDIMENT RANGE 101-B
C RI & P RR
SEDIMENT RANGE 102-B
LOCAL ROAD
IOWA HWY. #5
WITH RESERVOIR
WITHOUT RESERVOIR
0
5
10
15
20
25
30
35
DISTANCE (FEET 1000) 5000 FEET ABOVE

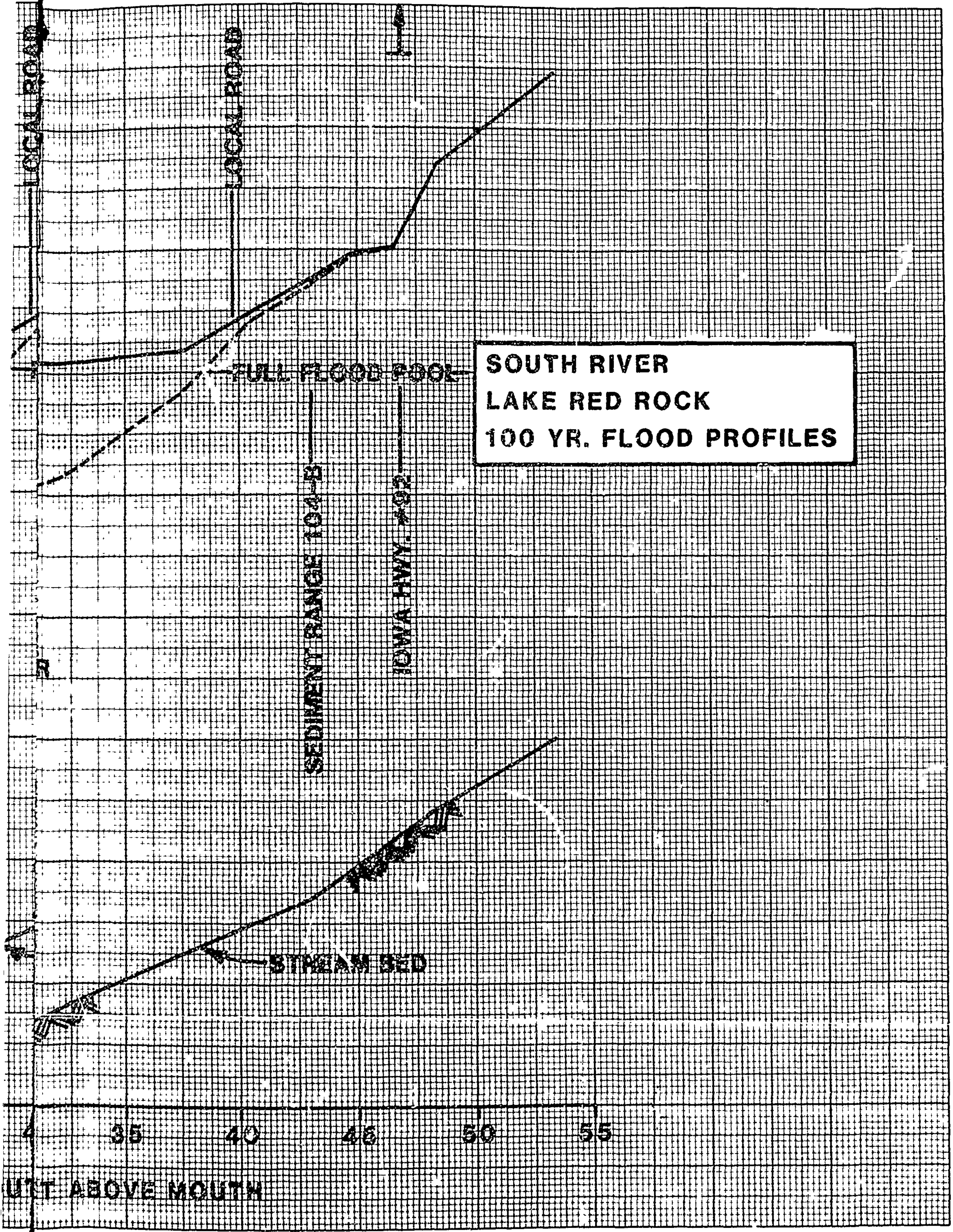
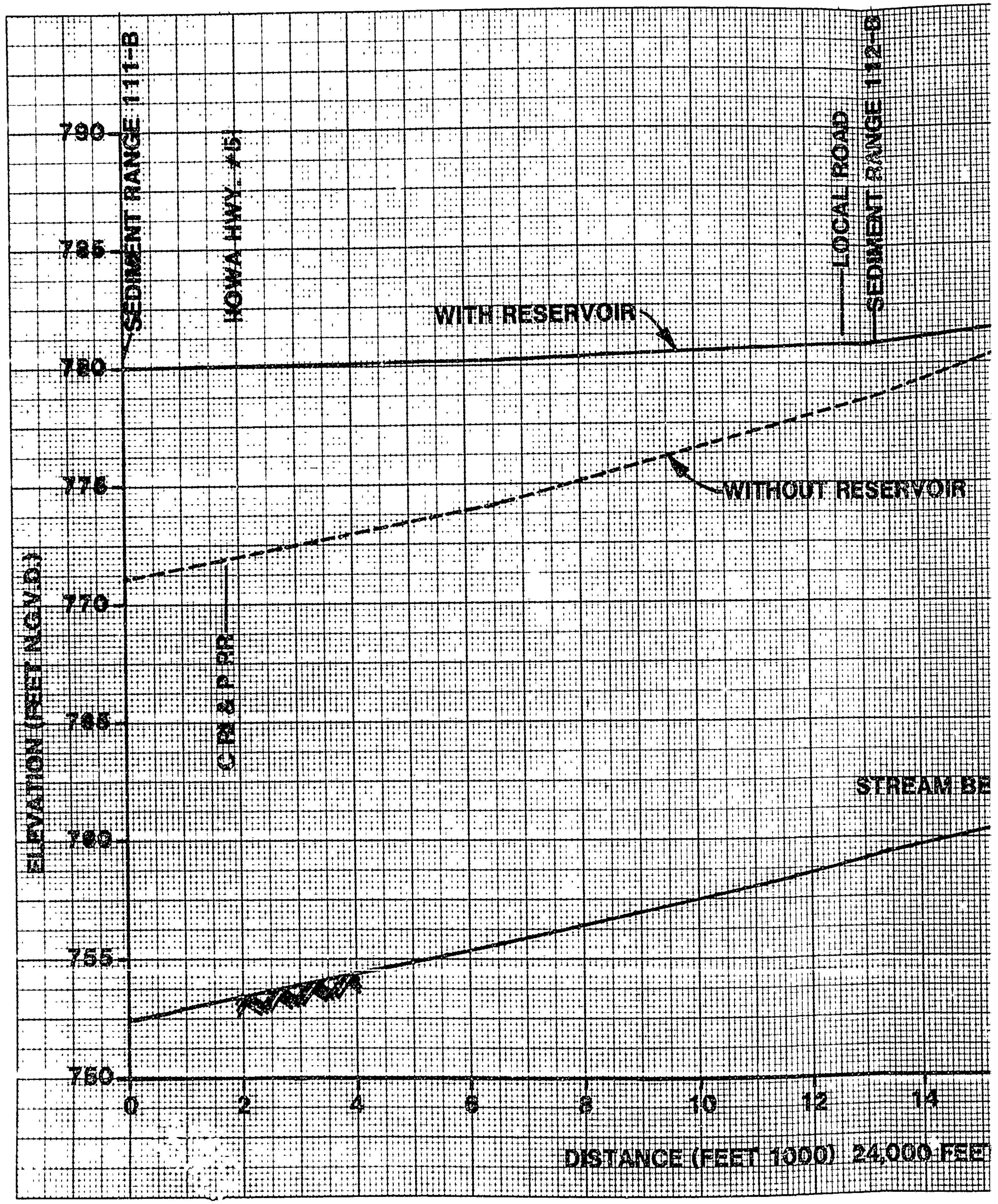

LOCAL ROAD
LOCAL ROAD
FULL FLOOD POOL
SOUTH RIVER
LAKE RED ROCK
100 YR. FLOOD PROFILES
SEDIMENT RANGE 104-B
IOWA HWY. #92
STREAM BED
35
40
45
50
55
ABOVE MOUTH

PLATE D-18



SEDIMENT RANGE 111-B
IOWA HWY. #15
LOCAL ROAD
SEDIMENT RANGE 112-B
WITH RESERVOIR
WITHOUT RESERVOIR
C M & P RR
STREAM BE
ELEVATION (FEET N.G.V.D.)
790
785
780
775
770
765
760
755
750
0
2
4
6
8
10
12
14
DISTANCE (FEET 1000) 24,000 FEET

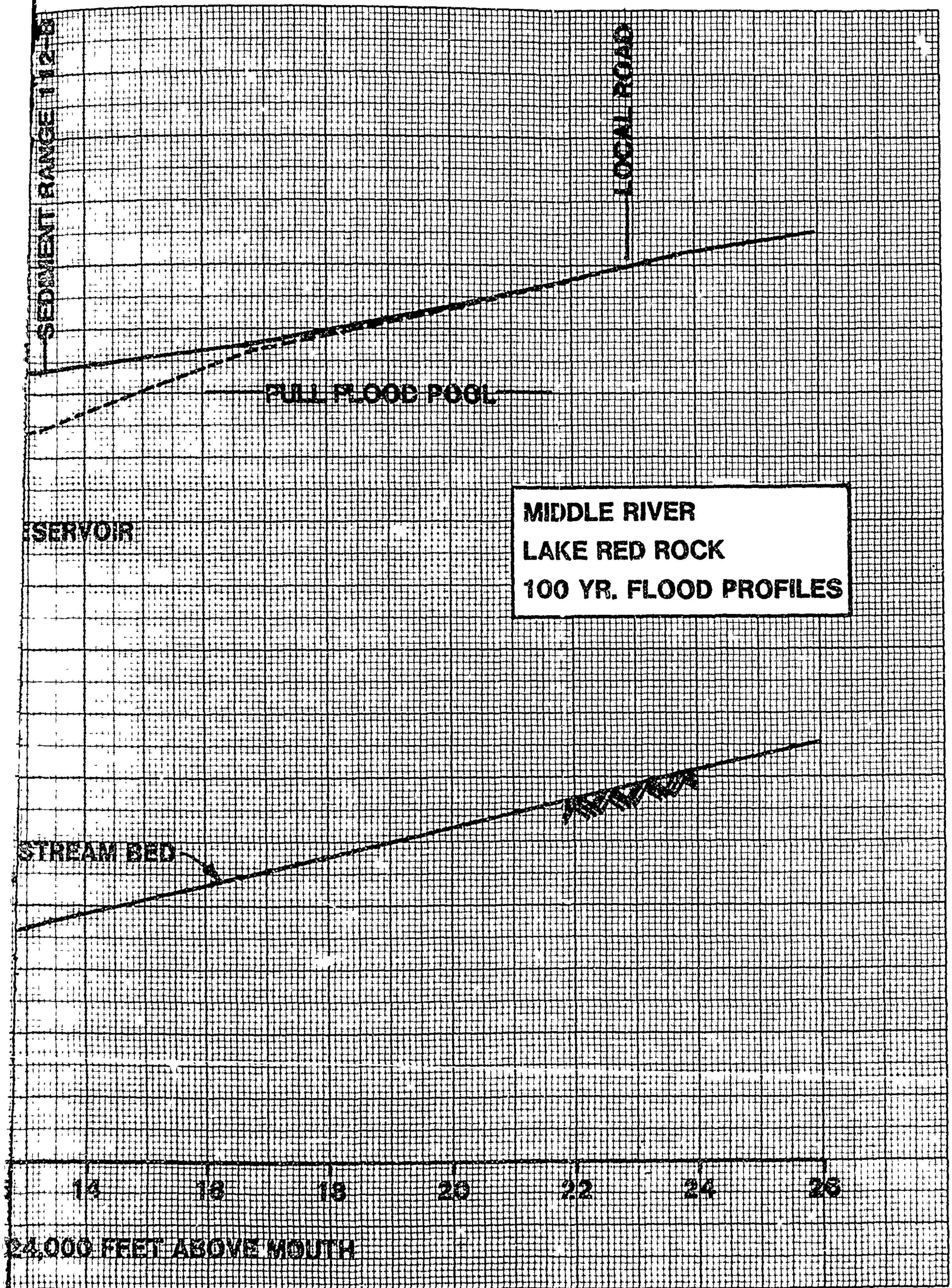
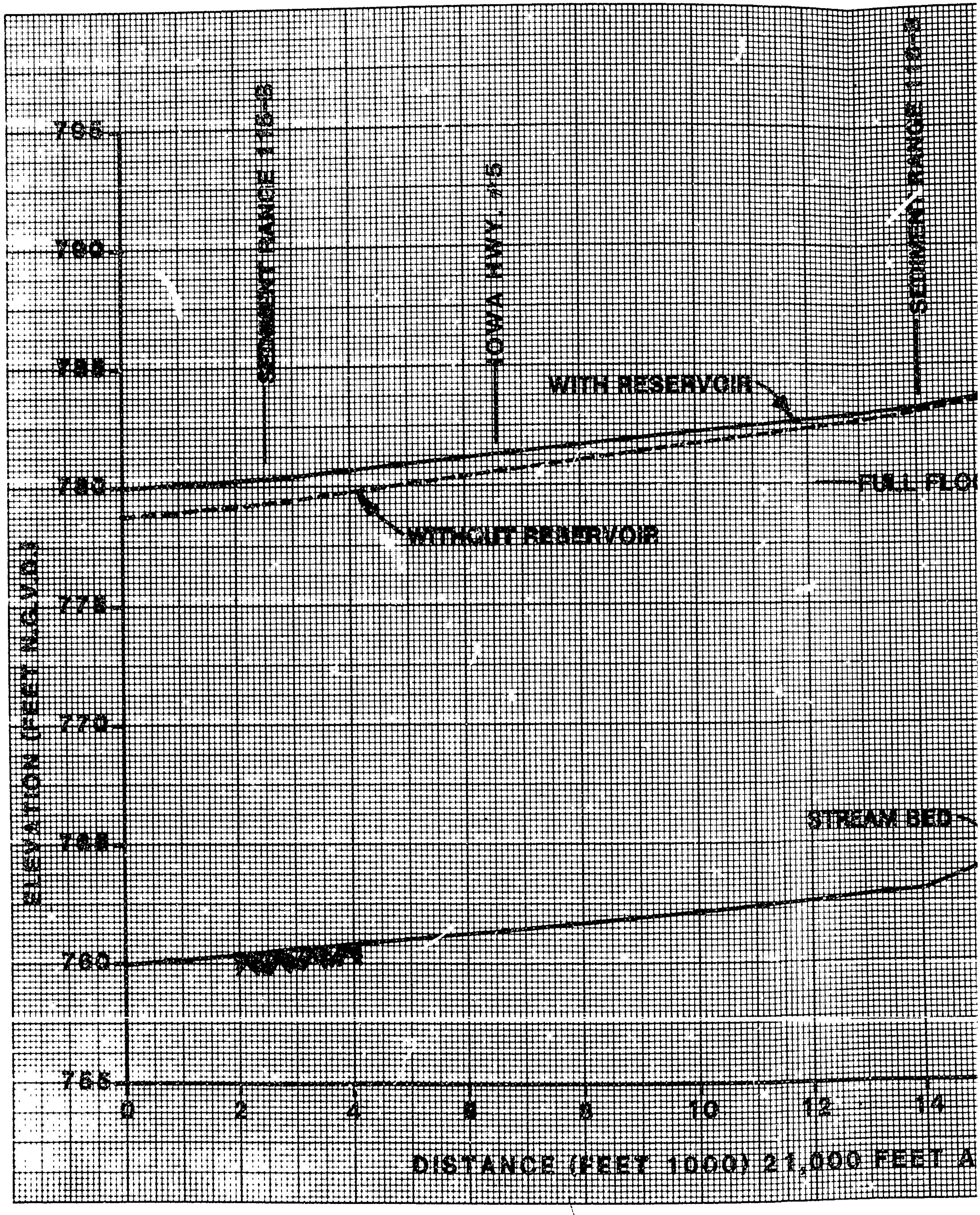
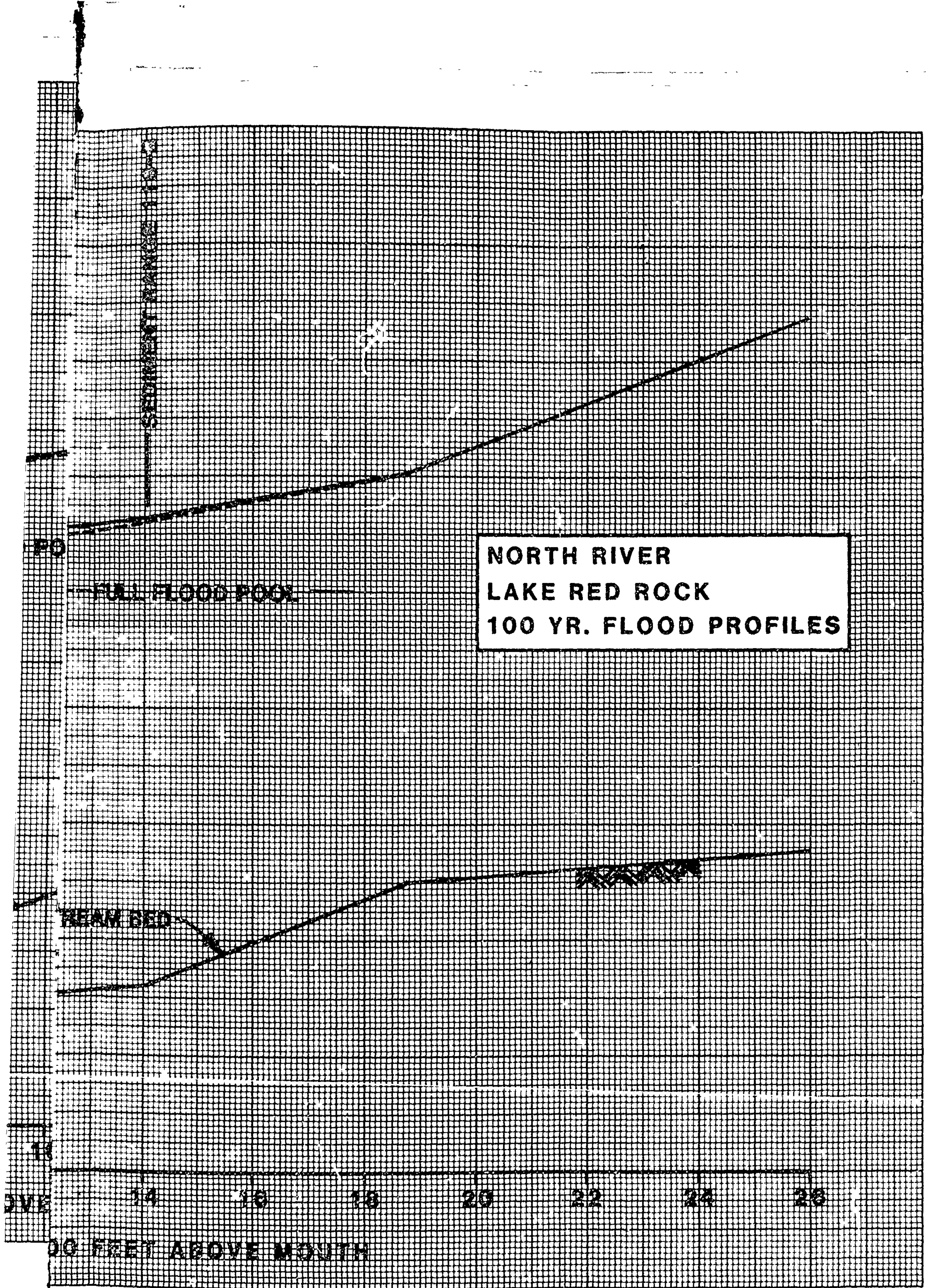

SEDIMENT RANGE 112-8
LOCAL ROAD
FULL FLOOD POOL
MIDDLE RIVER
LAKE RED ROCK
100 YR. FLOOD PROFILES
ESERVOIR
STREAM BED
14
16
18
20
22
24
26
24,000 FEET ABOVE MOUTH

PLATE D-19



SEDIMENT RANGE 115-5
IOWA HWY. #5
SEDIMENT RANGE 110-5
WITH RESERVOIR
WITHOUT RESERVOIR
FULL FLO
STREAM BED
ELEVATION (FEET N.G.V.D.)
795
790
785
780
775
770
765
760
755
0
2
4
6
8
10
12
14
DISTANCE (FEET 1000) 21,000 FEET A



SEDIMENT RANGE
PO
FULL FLOOD POOL
NORTH RIVER
LAKE RED ROCK
100 YR. FLOOD PROFILES
REAM BED
OVE
14
16
18
20
22
24
26
00 FEET ABOVE MOUTH

PLATE D-20

PROJECT BACKGROUND

A P P E N D I X

E

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX E
PROJECT BACKGROUND

In 1944, Congress enacted Public Law 78-534, 78th Congress, second session, which authorized the Red Rock Dam substantially in accordance with the recommendations of the Chief of Engineers in House Document No. 651, 78th Congress, second session. The House Document (para. 61) contemplated a multi-purpose reservoir having 1,200,000 acre-feet of storage divided as follows:

800,000 acre-feet	-	flood control
400,000 acre-feet	-	power, recreation, conservation, related uses

In 1958, prior to the construction of Lake Rock Rock, Congress authorized the construction of Saylorville Lake, substantially in accordance with the recommendations of the Chief of Engineers in Senate Document No. 9, 85th Congress, first session (Section 203, Public Law 85-500, 85th Congress, second session). The authority for the review report contained in Senate Document No. 9 required complete investigation and analysis of the flood problems in the Des Moines River. Projects authorized, but not built, were wholly or partially re-examined to ascertain whether inclusion of these projects in the overall plan furnished the best solution. Nine dam sites, including the already authorized Lake Red Rock (Howell site), were studied in a preliminary manner. All but two sites were discarded. The goal was to provide flood control storage for the greatest flood of record on the lower Des Moines River (1947) and, if possible, the Standard Project Flood (SPF).

The report concluded that the 1947 flood could be reduced to the zero damage flow (20,000 cubic feet per second (ft3/s)) at Ottumwa with 525,000 acre-feet of storage at Saylorville Lake and 1,850,000 acre-feet at Lake Red Rock. The combined system would reduce the crest discharge of the SPF by as much as 60 percent. Also included in the system of reservoirs was storage for conservation purposes (including low flows below both the Saylorville Lake and Lake Red Rock projects).

During the review of a definite project report on Lake Red Rock, the Iowa Conservation Commission (ICC) requested allocation of 50,000 acre-feet of storage for conservation. This storage would provide 300 ft3/s minimum releases to maintain desirable water quality and supply at the Ottumwa, Iowa, gage. In Senate Document No. 9, this conservation storage was shifted from Lake Red Rock to Saylorville Lake and increased from 50,000 to 75,000 acre-feet.

As a result of this shift, low flows would be maintained at both Des Moines (200 ft3/s) and Ottumwa (300 ft3/s). The primary reason for the shift was the high sedimentation rates anticipated for Lake Red Rock with a large permanent pool. With the shift, the Lake Red Rock conservation pool was reduced to 3,300 acre-feet (750 surface acres).

With a permanent pool of 50,000 acre-feet, Lake Red Rock was estimated to lose about 10 percent (180,000 acre-feet) of its total capacity within a 50-year period. By operating with the smaller permanent pool, only 5 percent (90,000 acre-feet) of the total capacity would be lost, or a savings of approximately 90,000 acre-feet within the same 50-year period.

During construction of Lake Red Rock, the Corps of Engineers prepared Design Memorandum No. 3, Supplement 1, dated October 13, 1961. This design memorandum studied the need for conservation storage at Lake Red Rock in order to meet the low flows desired by the Iowa Natural Resources Council (includes ICC). The Council was anxious to have the storage available in case of drought. The Council stated that 200 ft3/s at Des Moines and 300 ft3/s at Ottumwa were considered the absolute minimum. Studies by the Council indicated that the proposed 75,000 acre-feet of conservation storage at Saylorville Lake, combined with the proposed 3,300 acre-feet at Lake Red Rock, would not provide the minimum flows identified by the Council and in the Senate Document.

The Council and the Corps of Engineers advocated establishment of a conservation pool with 50,000 acre-feet of storage for low flows at Lake Red Rock. The conservation pool at elevation 725 feet NGVD would provide approximately 90,000 acre-feet for conservation and sediment storage and would enable operation of the two reservoirs to achieve the desired low flows at Des Moines and Ottumwa. The design memorandum stated that a pool at elevation 725 feet NGVD would not appreciably encroach upon the flood storage capacity of Lake Red Rock.

It was recognized that sedimentation would fill in the conservation pool over time. The Council recommended that the pool be raised periodically to maintain the 50,000 acre-feet of conservation storage over the sediment. The Corps of Engineers decided to defer a recommendation on the problem until the need to raise the pool again presented itself.

The Chief of Engineers approved establishment of a conservation pool at elevation 725 feet NGVD on April 30, 1962. The Office of the Chief of Engineers (OCE) determined that a conservation pool could be accommodated within the requirements for a sedimentation reserve under existing authority. Although Senate Document No. 9 acknowledged that substantial sedimentation would occur at Lake Red Rock, specific sedimentation reserve was not provided.

In effect, the solution presented by OCE was to establish a sedimentation reserve of 90,000 acre-feet under existing authority as part of an operational plan and in the process provide a conservation pool. OCE stated that this 90,000 acre-feet would accommodate a sedimentation reserve for the 100-year project life and cautioned that any increase in the pool for conservation or recreation would require congressional authorization.

On May 31, 1979, the Corps of Engineers temporarily raised the pool level at Lake Red Rock from elevation 725 feet to elevation 728 feet NGVD pending completion of the required environmental and water quality studies. This raise was prompted by the drought of 1977 and the loss of adequate storage for low-flow releases due to sedimentation. Corps of Engineers studies indicated that the raise from elevation 725 feet to elevation 728 feet NGVD would not have an adverse effect on flood control operation. In addition, the Corps of Engineers completed the required environmental assessment and Finding of No Significant Impact. The permanent change was approved on August 17, 1979. Since that time, the lake has been operated with a permanent pool at elevation 728 feet NGVD.

Ongoing studies have further refined the sedimentation rates presented in various reports and congressional documents. Since 1985, there is in excess of 39,000 acre-feet of sediment below elevation 725 feet NGVD and more than 79,000 acre-feet in the whole reservoir. This represents about a 4 percent decrease in flood storage of the entire reservoir. The most recent survey by the Corps of Engineers indicated an average annual sedimentation rate of 3,500 acre-feet over the 100-year life of the project, or a total of 350,000 acre-feet. This represents approximately 20 percent of the flood control storage capacity.

With the Iowa Natural Resource Council's request for a permanent pool of 50,000 acre-feet to ensure low flows of 300 ft3/s at Ottumwa, the combined storage of 400,000 acre-feet would require a pool level of elevation 742 feet NGVD, 17 feet above the previously approved elevation of 725 feet NGVD. Such a pool would require about 20 percent of the existing flood control storage. (The pool at elevation 725 feet NGVD required about 5 percent of the flood control storage). Based upon observations and operation since 1969, it appears that the ability of the project (as a system) to control a 100-year event with zero damage flows at the Ottumwa gage would not be adversely impacted with a permanent pool elevation at 742 feet NGVD.

Elevation 742 feet NGVD allows for the projected 100-year sedimentation storage (350,000 acre-feet) plus 50,000 acre-feet for a conservation pool. The alternatives identified by the Corps of Engineers include raising the pool in different increments or all at once. These alternative plans were presented to the public in March 1985 in a report entitled <u>Alternatives to the Regulation of Lake Red Rock, Des Moines River, Iowa</u>.

The adjustment in the pool level accounts for physical changes which have occurred since the project was placed in operation, as well as refinement in the estimate of the sedimentation reserve required for the life of the project. Further adjustment of the level of Lake Red Rock is necessary in order to recoup the sedimentation reserve which has been lost since operation of the project began. The following summarizes the factors relating to a pool raise:

a. Raising the pool to elevation 742 feet NGVD would diminish the flood storage by 20 percent. The project, however, would still be able to control the design flood.

b. The existing decrease in the flood storage capacity of approximately 79,000 acre-feet is a result of sedimentation over which the Corps of Engineers has no control.

c. Low-flow augmentation for water quality is even more highly regarded today than it was 23 years ago, as evidenced by recent letters from the Iowa Natural Resources Council.

d. The 90,000 acre-feet provided in the initial conservation pool included 40,000 acre-feet as an initial reserve for sediment which was not intended to be the total storage allotment.

The readjustment would maintain a minimum 50,000 acre-feet for low-flow releases and provide storage for sediment for the 100-year life of the project.

ECONOMIC AND SOCIAL ANALYSIS

APPENDIX F

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX F
ECONOMIC AND SOCIAL ANALYSIS

TABLE OF CONTENTS

List of Tables

TABLE OF CONTENTS (Cont'd)

List of Tables (Cont'd)

List of Plates

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX F
ECONOMIC AND SOCIAL ANALYSIS

INTRODUCTION

The proposed Lake Red Rock Water Control Plan was analyzed relative to three major areas of possible economic impacts: flood damage effects on downstream reaches; flood damage effects in the pool area; and effects on pool area recreational opportunities. Economic and demographic profiles of the area of influence, along with land use and other pertinent data, are included in the Supplemental Environmental Impact Statement (SEIS).

Eight alternative conditions were considered in this analysis: the Base Condition (no action); five pool raise alternatives of various elevation and scheduling; a dry pool reservoir; and dredging of accumulated sediment in the pool area. These proposals are analyzed in sections of this appendix.

THE BASE CONDITION

The Base Condition (existing, no action) would maintain current discharge rates and would adhere to pool elevations as charted on plate F-1. This is the condition against which the other pool raise alternatives were measured. With the Base Condition, certain areas of the reservoir pool are unusable for boating/fishing or have limited access because of the continuing siltation process. Under current operating plans, the pool will be raised periodically to maintain a minimum conservation pool, while allowing for sediment storage.

DOWNSTREAM EFFECTS

Under the proposed Water Control Plan, a change in flood damages in downstream reaches would be indiscernable, regardless of which pool raise plan is recommended. Downstream stage/duration and flow/frequency curves were compared for the existing condition and the five pool raise alternatives (all pool raise alternatives include increased discharges). These curves show that significant measurable changes in downstream effects are nonexistent. Rock Island District hydraulic engineers verified this data interpretation.

RESERVOIR POOL EFFECTS

Approximately 29,100 acres of land is currently in crop use in the reservoir pool area. Raising the level of the Red Rock conservation pool would increase flood damages to these agricultural-use acres. The extent of increased crop damages varies among the alternative pool raise plans.

DAMAGE PER ACRE

To compare the increase in agricultural damage among pool raise alternatives, a weighted annual damage value per acre was calculated. It was assumed that after the pool rises during floodwater storage, the water is held and released slowly over several days. Therefore, once pool levels reach a certain elevation, the crop is lost on all acres up to that elevation.

In arriving at an annual dollar damage amount per acre, typical monthly production budgets for corn and soybeans were used (modeled after budgets developed by the U.S. Department of Agriculture). Gross cash yield per corn acre of $210 was determined from an expected yield of 120 bushels multiplied by the normalized (program free) price of $1.75 per bushel. The normalized price for soybeans is $4.25 per bushel; an expected yield of 34 bushels per acre produces a gross cash yield of $145 per acre.

In calculating damageable values for affected commodities, monthly fixed and variable costs were considered. It was assumed that, where possible (as dictated by local conditions and cropping practices), acreage would be replanted with the same or alternate crops after a flood event. Reductions or loss of cash yields, as well as replanting costs, were estimated as appropriate. Table F-1 summarizes estimated crop loss from flooding by month (no damages assumed for January, February, or December floods). The damage weighting factor was the percent of total runoff which occurs in the Red Rock Reservoir drainage area.

TABLE F-1

Crop Acre Damages by Month
Red Rock Drainage Area

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total ($)
Soybeans										
Expense/Crop Loss ($)	1.30	6.05	13.00	95.50	132.40	132.90	110.40	47.60	28.00	
Damage Factor (%)	12.6	15.4	14.3	13.2	12.1	7.3	4.1	4.9	3.8	
Weighted Damage ($)	.16	.92	1.86	12.61	16.02	9.70	4.53	2.33	1.06	49.19
Corn										
Expense/Crop Loss ($)	1.40	5.10	31.25	195.00	182.30	182.60	183.30	127.40	33.1	
Damage Factor (%)	12.6	15.4	14.3	13.2	12.1	7.3	4.1	4.9	3.8	
Weighted Damage ($)	.18	.79	4.47	25.74	22.06	13.34	7.52	6.24	1.26	81.60

According to Soil Conservation Service estimates, cropping patterns in the study area are 65 percent corn and 35 percent soybeans. This crop mix equates to a per acre annual damageable estimate of $70.26 ($81.60 * 65% + $49.19 * 35%).

AVERAGE ANNUAL DAMAGES

Table F-2 presents estimates for cropped acres and inundation damages at pool elevation intervals. For each alternative pool raise plan, elevation/frequency and average annual damages are listed. (Refer to appendix A for detailed elevation/frequency data.)

TABLE F-2

Agricultural Damages ($1000's)
Elevation/Frequency/Damage Data

			Frequencies					
Elevation (NGVD)	Crop Acres Flooded	Crop Damage ($1000's)	Existing Condition	Plan 1	Plan 2	Plan 3	Plan 4	Plan 7
730	0	0	.99	.99	1.00	1.00	1.00	1.00
735	600	95.8	.85	.85	1.00	1.00	.97	1.00
740	1,300	191.6	.60	.60	1.00	.87	.80	.90
745	2,400	306.6	.40	.36	.66	.66	.54	.60
750	3,700	431.1	.31	.29	.36	.32	.32	.32
755	5,200	574.8	.25	.25	.25	.25	.25	.25
760	7,100	766.4	.20	.19	.20	.20	.20	.20
765	9,500	1,005.9	.14	.12	.14	.14	.14	.14
770	12,600	1,341.2	.08	.065	.07	.07	.07	.07
775	17,000	1,820.2	.04	.025	.03	.03	.03	.03
780	27,000	2,787.8	.001	.001	.001	.001	.001	.001
Average Annual Damages ($000's)			$338.8	318.7	401.4	387.4	369.3	384.4
Less Existing Condition AAD				-338.8	-338.8	-338.8	-338.8	-338.8
Increase in AAD Resulting from Pool Raise Plans				-20.1	62.6	48.6	30.5	45.6

An increase in Average Annual Damages (AAD) is a project cost. AAD increases are included in the summary of benefits and costs (table F-10).

RECREATIONAL ENHANCEMENT

Raising the elevation of the Lake Red Rock conservation pool would enhance recreational opportunities in several ways. Three obvious and quantifiable (according to Planning and Guidance Unit Day Value procedures) recreational benefits are: an enhanced aesthetic environment resultive from covering unsightly mudflats; a higher quality fishing and hunting environment; and an increased carrying capacity due to a permanently larger lake surface area (table F-3).

TABLE F-3

Recreation Benefit
Unit Day Value Method
General Recreation

Criteria	Point Assignment			Comments
	Existing Condition	Periodic Mudflats Elimination	Permanent Larger Lake Area	
Recreation Experience	8	8	14	A larger pool area will provide for high quality fishery and waterfowl hunting, as well as several general activities.
Availability of Opportunity	12	12	12	No comparable alternative within 1 hour travel time.
Carrying Capacity	6	6	8	Increased lake size will provide greater user capacity and enhanced facility.
Accessibility	15	15	15	Good access.
Environmental Quality	2	6	2	Covering of mudflats will enhance aesthetics and environmental quality on a temporary basis.

TABLE F-3 (Cont'd)

Criteria	Point Assignment			Comments
	Existing Condition	Periodic Mudflats Elimination	Permanent Larger Lake Area	
Total Points	43	47	51	
$ Value (1987)	3.38	3.62	3.83	
$ Change in Value From Existing Condition		.24	.45	

Regardless of which pool raise alternative is chosen, all plans (including the existing condition) would result in a covering of the siltation mudflats. (Refer to table F-3 for Unit Day Value Adjustment rationale). However, this would be a temporary benefit because siltation would continue and the mudflats would reappear. Therefore, smaller, "stair step" increases would be more beneficial in covering the mudflats at repeated intervals than a large, quick pool level increase to the maximum elevation. Plate F-2 shows this effect. This graph contrasts, for example, Plans 2 and 4; a single-step versus a multi-step alternative. Both plans cover the unsightly mudflats, but timing of initial raise and incremental raises affects the present value of benefits to the Red Rock user. Plan 4 has an earlier initial pool raise (and therefore a higher present value of benefits stream) and also has subsequent raises which prolong the benefit stream. This timing and subsequent pool raise situation greatly affect the evaluation of alternative plans. Plate F-1 shows the timing and pool raise elevations for the various alternatives, while table F-5 compares alternatives concerning mudflat coverage benefits.

For purposes of clarification of the mudflat benefit calculation, Plan 4 will be used as an example. As indicated in table F-3, the value of a visit to Lake Red Rock realizes an estimated $0.24 increase for covering of the unsightly mudflats (UDV per P&G). This increase raises the estimated value of a reservoir visit from $3.38 to $3.62. However, as sedimentation continues, the mudflats will gradually reappear, and the visitation value will decline to the original $3.38 (refer to plate F-2). This total reappearance is estimated to take place over a 25-year period. The benefit, then, to covering the mudflats declines from $0.24 per visit to zero over the 25-year period, at an even rate.

To assess the Base Year value of the mudflat coverage, the timing of the first and subsequent pool raises for each alternative plan is critical. For example, Plan 4 has its first mudflat covering pool raise in the Base Year (1988) and realizes a $0.24 value increase per visit in the Base Year. This incremental value declines for 6 subsequent years (to $0.18), as siltation continues. Then, a second pool raise is implemented, re-covering the mudflats and restoring to full $0.24 increase in value. The restored $0.24 value then declines for 10 years (to $0.14) until Plan 4 has its third and final raise, which again restores the full $0.24 increase in value. The final value increase will decline to zero (to the original $3.383 per visit) over a 25-year period.

The value each year, for covering the mudflats, must be discounted (at 8-5/8%) to the base year and summed. Table F-4 depicts this summation for the first pool raise under Plan 4. Table F-5 summarizes these computations for all plans.

TABLE F-4

Present Worth Analysis

Year	Value Increase ($)	Present Worth Factor (8-5/8%)	Present Worth ($)	Cummulative Present Worth ($)
1	0.24	.921	.221	.221
2	0.23	.848	.195	.416
3	0.22	.780	.172	.588
4	0.21	.718	.151	.738
5	0.20	.661	.132	.871
6	0.19	.608	.116	.986

TABLE F-5

Comparison of Alternatives
Mudflat Coverage Benefits

Base Year Value of Incremental Pool Raises	Existing	Plan 1	Plan 2	Plan 3	Plan 4	Plan 7
Raise No. 1 ($)	.988	.988	1.495	1.373	.986	1.373
Raise No. 2 ($)	.125	.125	--	.653	.801	.653
Raise No. 3 ($)	.016	.016	--	--	.432	--
Base Year Value (per existing visit) of Benefit Stream ($)	1.129	1.129	1.495	2.026	2.219	2.026
Value Annualized @ 8-5/8% 81 years (.08635)	.097	.097	.129	.175	.192	.175
Multiplied by Base Year Visitations of 1,170,000 ($)	113,500	113,500	150,900	204,800	224,600	204,800
Less Existing Condition		-113,500	-113,500	-113,500	-113,500	-113,500
Mudflat Coverage Benefits ($)		0	37,400	91,300	111,100	91,300

In addition to temporarily covering mudflats, each of the pool raise plans would provide a permanently larger lake area. This would be a beneficial effect as backwater and "fingerlet" areas are filled and the larger lake area develops. More shoreline, greater surface area, and an overall more aesthetically pleasing park would result, and total recreational carrying capacity would be increased. Boating and other outdoor recreational activities would be enhanced, and fish and wildlife habitat would be improved. Table F-3 details the rationale for this permanent increase in the value of a visit to Lake Red Rock, as computed by the Unit Day Value Method.

To quantify and compare the beneficial effects of a permanently larger lake area, a time-value-weighted lake capacity was computed for each pool raise alternative. This weighting considered the annual elevation and lake capacity for each plan. These annual capacity data were discounted to the base year (for time-value-weighting) and summed. Since Plan 2 would result in the greatest lake capacity over the remaining life of the project, it was used as the maximum value standard against which the other plans were compared. The base year value (per existing visit) for Plan 2 is the discounted stream of benefits from the increased Unit Day Value due to a larger lake area. Table F-6 lists the various plans with their capacities and related recreational assignments.

TABLE F-6

Lake Capacity Comparison
Permanently Larger Lake Area Benefits

	Existing	Plan 1	Plan 2	Plan 3	Plan 4	Plan 7
Average Annual Lake Capacity (acre-feet)	107,100	107,100	254,200	204,300	169,500	189,300
Percent of Maximum (%)	42.1	42.1	100.0	80.4	66.7	74.5
Base Year Value (per existing visit) of Benefit Stream ($)	2.020	2.020	4.799	3.858	3.201	3.575
Value Annualized @ 8-5/8% 81 years (.08635)	.174	.174	.413	.333	.276	.309
Multiplied by Base Year Visitations of 1,170,000	203,600	203,600	483,200	389,600	322,900	361,500
Less Existing Condition		-203,600	-203,600	-203,600	-203,600	-203,600
Larger Lake Area Benefits		0	279,600	186,000	119,300	157,900

For each alternative plan, recreation benefits were calculated using a current visitation level of 1,170,000 visits annually. This level was calculated based on the trend line of historical visitations. Actual visitation data for the past decade are included in table F-7.

TABLE F-7

Historical Visitation Data

Year	Total Visits
1985	1,178,300
1984	1,089,800
1983	891,300
1982	883,900
1981	923,000
1980	953,600
1979	830,500
1978	850,200
1977	996,400
1976	1,172,500

FUTURE GROWTH OF RECREATION VISITS

Projection of future visitation trends at the Lake Red Rock recreation facility was based on a weighted average of estimates for population growth and growth of boater registrations. This approach used two major determinants of recreational usage; population and boat registrations. A factor of 1.72 percent growth per year for Red Rock visitations was a composite factor weighting population trends (2/3) and boater registration trends (1/3) for the area (counties) of project influence. This growth trend was projected to year 2010, as a reasonable limit, with a no-growth scenario thereafter.

The projected increase in visitations at Lake Red Rock was discounted, summed, and annualized to yield a base year average annual equivalent increase in visitations due to future growth. This visitation increase was then multiplied by the annual dollar value increase per visit due to each alternative pool raise plan to compute the future benefits to recreation. Table F-8 shows the future recreational benefits computation.

TABLE F-8

Comparison of Alternatives
Future Recreation Benefits

	Existing	Plan 1	Plan 2	Plan 3	Plan 4	Plan 7
Year 2010 Projected Visitations (1.72% growth)	1,730,000	1,730,000	1,730,000	1,730,000	1,730,000	1,730,000
Base Year 1988 Visitations	1,170,000	1,170,000	1,170,000	1,170,000	1,170,000	1,170,000
Increase	560,000	560,000	560,000	560,000	560,000	560,000
Multiply by .43260 (factor for discounting, summing, and annualizing 22 years growth, 8-5/8%, 81 years life), Equals Annual Equivalent Future Increase in Visitations	242,300	242,300	242,300	242,300	242,300	242,300
Multiply by Annual Increase in Value Per Visit (combined Larger Lake effect and mudflat coverage) ($)	.271	.271	.542	.508	.468	.484
	65,700	65,700	131,300	123,100	113,400	117,300
Less Existing Condition		-65,700	-65,700	-65,700	-65,700	65,700
Future Recreational Benefits ($)		0	65,600	57,400	47,700	51,600

DISCUSSION OF NON-POOL RAISE ALTERNATIVES

DRY POOL

Under this alternative, the reservoir would return to a riverine system except when storing floodwater. There would be no conservation pool. This alternative would provide the greatest flood control benefits, but would greatly reduce recreational benefits and aesthetic value. Because recreational use has become an integral part of the Lake Red Rock project, a dry reservoir pool is not an acceptable alternative and will not be evaluated further in this study.

POOL SEDIMENT DREDGING

This alternative would dredge accumulated sediment from the reservoir pool area. Based on estimates for dredging cost ($720,000,000) and excessive time required, this alternative would be very expensive and time consuming compared to the minor benefits received. Boating and fishing conditions would realize short-term benefits, and flood control would not be improved significantly. Due to cost ineffectiveness and minor benefit enhancement potential, this alternative will not be pursued further.

COST OF POOL RAISE PLANS

All pool raise alternatives would require essentially the same construction, relocation, and mitigation work, with the same estimated costs. However, the scheduled timing of these costs greatly affects the base year value of these outlays. For example, a base year pool raise (with attendant marina relocations) has a higher present worth cost than a pool raise plan which reaches the same elevation, say, 10 years later. Table F-9 details the present worth cost scenario for each plan. All costs reflect a 1988 base year and discount rate of 8-5/8 percent.

SUMMARY OF BENEFIT AND COST DATA

Table F-10 presents the summary of benefits and costs for Plans 1, 2, 3, 4, and 7.

TABLE F-9

Pool Raise Costs - Present Worth Analysis (Base 1988, 8-5/8%)

			Costs ($1000)					($1000)		
Plan	Elev.	Year	Const.	Arch	F&WL	Total	Year to Base	Prsnt Worth Factor	Prsnt Worth Costs ($)	Totals ($)
		1993		100		100	5	.661	66.1	
1 &	733	1994	278	50	50	378	6	.609	230.2	
Base	738	2019	1,375		20	1,395	31	.077	107.4	
Cond.	742	2044			130	130	56	.010	1.3	
										40
2		1988		100		100	0		100.0	
	742	1989	1,646	50	200	1,896	1	.921	1,746.2	
										1,872.0
3	736	1988	1,653		70	1,723	0	1.000	1,723.0	
		1993		100		100	5	.661	66.1	
		1994		50		50	6	.609	30.5	
	742	1999			130	130	11	.266	52.4	
										1,872.0
4	732	1988	278		50	328	0	1.000	328.0	
		1993		100		100	5	.661	66.1	
	736	1994	1,375	50	20	1,445	6	.609	880.0	
	742	2004			130	130	16	.266	34.6	
										1,308.7
7	734	1988	1,653		70	1,723	0	1.000	1,723.0	
		1993		100		100	5	.661	66.1	
		1994		50		50	6	.609	30.5	
		1999			130	130	11	.403	52.4	
										1,872.0

TABLE F-9 (CONT'D)

	Comparative Annual Charges ($1000)					
	Base Condition	Plan 1	Plan 2	Plan 3	Plan 4	Plan 7
Discounted Costs of Plan Implementation	405.0	405.0	1,846.2	1,872.0	1,308.7	1,872.0
Less Base Condition (Without Project) Costs		-405.0	-405.0	-405.0	-405.0	-405.0
Net Cost of Plan Implementation ($)		0	1,441.2	1,467.0	903.7	1,467.0
Annualized @ 8-6/8% 81 Years Remaining Life (.08636)		0	124.5	126.7	78.0	126.7

TABLE F-10

Summary of Benefit and Cost Data 1/
Pool Raise Alternatives ($1,000)
December 1987 Prices, 8-5/8%, 81 Years Remaining Life

	Plan 1	Plan 2	Plan 3	Plan 4	Plan 7
Annual Benefits:					
Larger Lake Area	0	279,600	186,000	119,300	157,900
Mudflat Coverage	0	37,400	91,300	111,100	91,300
Future Recreational Enhancement	0	65,600	57,400	47,700	51,600
Increased Pool Area Flood Damage 2/	+ 20,100 3/	-62,600	-48,600	-30,500	-45,600
Total Annual Benefits	20,100	320,000	286,100	247,600	255,200

TABLE F-10 (CONT'D)

Annual Charges:					
Interest and Amortization @ 8-5/8%	0	124,500	126.700	78,000	126,700
Benefit-to-Cost Ratio	Infinite	2.6	2.3	3.2	2.0
Net Benefits	20,100	195,500	159,400	169,600	128,500

1/ Each alternative has been compared to the Existing Condition for evaluation of benefits and costs. The Existing Condition is identical to Plan 1, except for greater discharge rates under Plan 1 with proposed pool regulation procedures.

2/ Increased flood damage in the pool area is a disbenefit.

3/ Plan 1 has greater storage than the Existing Condition, and therefore reduced pool area flood damage.

SOCIAL IMPACT ASSESSMENT

GENERAL

Red Rock Dam provides floodwater storage capacity and recreational opportunities for southeastern Iowa. As part of the Red Rock project, a conservation pool supplements the low-flow augmentation releases from Saylorville Reservoir. This conservation pool periodically requires a raise in elevation to allow for sedimentation. Estimates of soil losses within the watershed indicate that a raise in pool elevation to approximately 742 feet National Geodetic Vertical Datum (NGVD) will eventually be necessary in order to provide 50,000 acre-feet of conservation storage in addition to the 100-year sediment storage.

Seven alternatives for dealing with the situation at Lake Red Rock have been proposed; however, two of these (dry reservoir and dredging the pool) are not acceptable. The remaining alternatives range from the current plan of operation (which requires raising the lake level several times to compensate for sedimentation) to a one-step raise of the conservation pool to elevation 742 feet NGVD. The following social impact assessment examines the impacts of the various pool raise alternatives.

AFFECTED PROPERTY

Lake Red Rock is located in north-central Marion County in the south-central portion of Iowa. The area is influenced by the cities of Knoxville and Pella, as well as more rural towns with small populations. The principal economic activity of the immediate project area is agriculture. Some important manufacturing and public activities are centered in the area, however, particularly Central College, a U.S. Veteran's Hospital, and three large manufacturers (the 3-M Company, the Rolscreen Company, and Vermeer Manufacturing Company).

The 1985 population of Marion County was about 28,900. As table F-11 shows, Marion County is estimated to have experienced a 2.7 percent decline in population from 1980 to 1985. However, this trend is expected to reverse during the next decade. In 1985, about 15 percent of Marion County's residents were 65 years of age and older, while approximately 26 percent of its population was under 18 years of age. The per capita income of Marion County in 1983 was $10,900.

TABLE F-11 1/

Population

Area	1970	1980	1985	1990	2000	Percent Change 1980 - 1985	1985 - 1990
Marion Co.	28,400	29,700	28,900	29,400	29,900	-2.7	+1.7
State of Iowa	2,825,000	2,913,800	2,905,400	2,913,500	3,004,900	-0.3	+0.3

EMPLOYMENT AND COMMUNITY GROWTH

The proposed alternatives would not directly affect the permanent employment or labor force of the Marion County area since the alternatives would involve only a small number of construction workers for relocating recreation facilities.

1/ The Iowa Department of Job Service, A Resource Handbook of Facts and Figures. A Guide to Iowa Department of Job Service Statistics and Other Statistics, July 1983.

With each of the alternatives the pool elevation would be raised, thereby increasing the attractiveness of Lake Red Rock to recreationists. This increased potential for recreation visitors at the lake could attract new businesses to the area and create new employment opportunities. While the number of visitors to the lake may increase with each of the five alternatives, it would likely increase more quickly with a one-step raise in the pool elevation to 742 feet NGVD.

REGIONAL GROWTH

No effect on regional growth is anticipated as a result of any of the alternatives to raise the pool. It should be noted that by raising the pool elevation, any one of the five acceptable alternatives would help to ensure that the Lake Red Rock tourism sites and the lake itself would remain attractive enough to maintain the current level of tourism.

COMMUNITY COHESION

Land surrounding Lake Red Rock is primarily undeveloped or used for agricultural purposes. No effect on community cohesion is expected due to the limited residential development in the project vicinity. Many farmers are not in favor of the planned pool raise because they perceive an increased risk of flooding due to any raise in pool elevation.

DISPLACEMENT OF PEOPLE

No relocations would be required with the pool raise alternatives.

PROPERTY VALUES

Although higher lake levels may increase values of residential or vacation "lake homes," agricultural properties may be adversely affected. Impacts appear minimal with each of the various pool raise alternatives.

TAX REVENUES

Any pool raise alternative would have negligible effects on the tax base for downstream properties. However, the various alternatives for raising the pool would have similar impacts on pool area property tax revenues. Without a raise in the pool elevation, a small decrease in boat ownership and purchases might result as the pool becomes more filled with sediment. Tax revenues would decline slightly as a result of decreased sales tax and boat license fee revenues. The proposed alternatives would prevent this loss in tax revenues.

PUBLIC FACILITIES AND SERVICES

Raising the pool level at Lake Red Rock would enhance users' recreational experiences by improving aesthetics, boating, fishing, and wildlife habitat. Each of the five alternatives would help to fulfill part of the recreational needs of south-central Iowa.

Recreation at various facilities would be temporarily disrupted during the construction of each alternative when the facilities would be relocated to higher elevation areas. A fast pool raise would more quickly provide the maximum enhancement of the pool for recreation purposes.

BUSINESS AND INDUSTRIAL ACTIVITIES

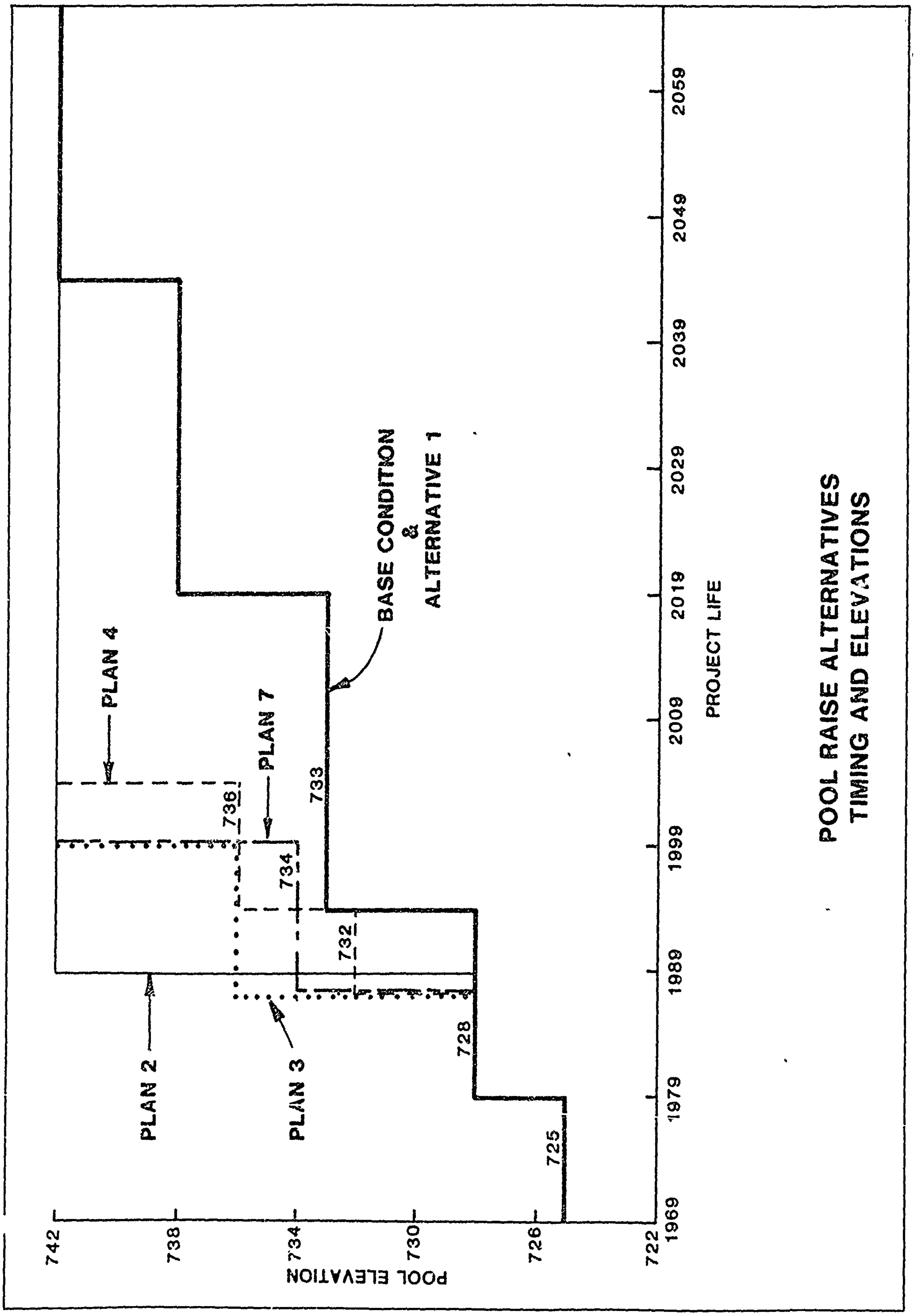
With each alternative, changes in business and industrial activity during construction would be minimal. As the pool level is raised and the potential for tourism increases, land in the vicinity of Lake Red Rock might become more attractive for commercial development. No businesses would be displaced as a result of the project.

FARM DISPLACEMENT

No farms would be displaced by any of the alternatives. Approximately 27,000 acres of land in the pool is currently in crop production. Following a raise in pool elevation, this land would have a minor increase in flooding.

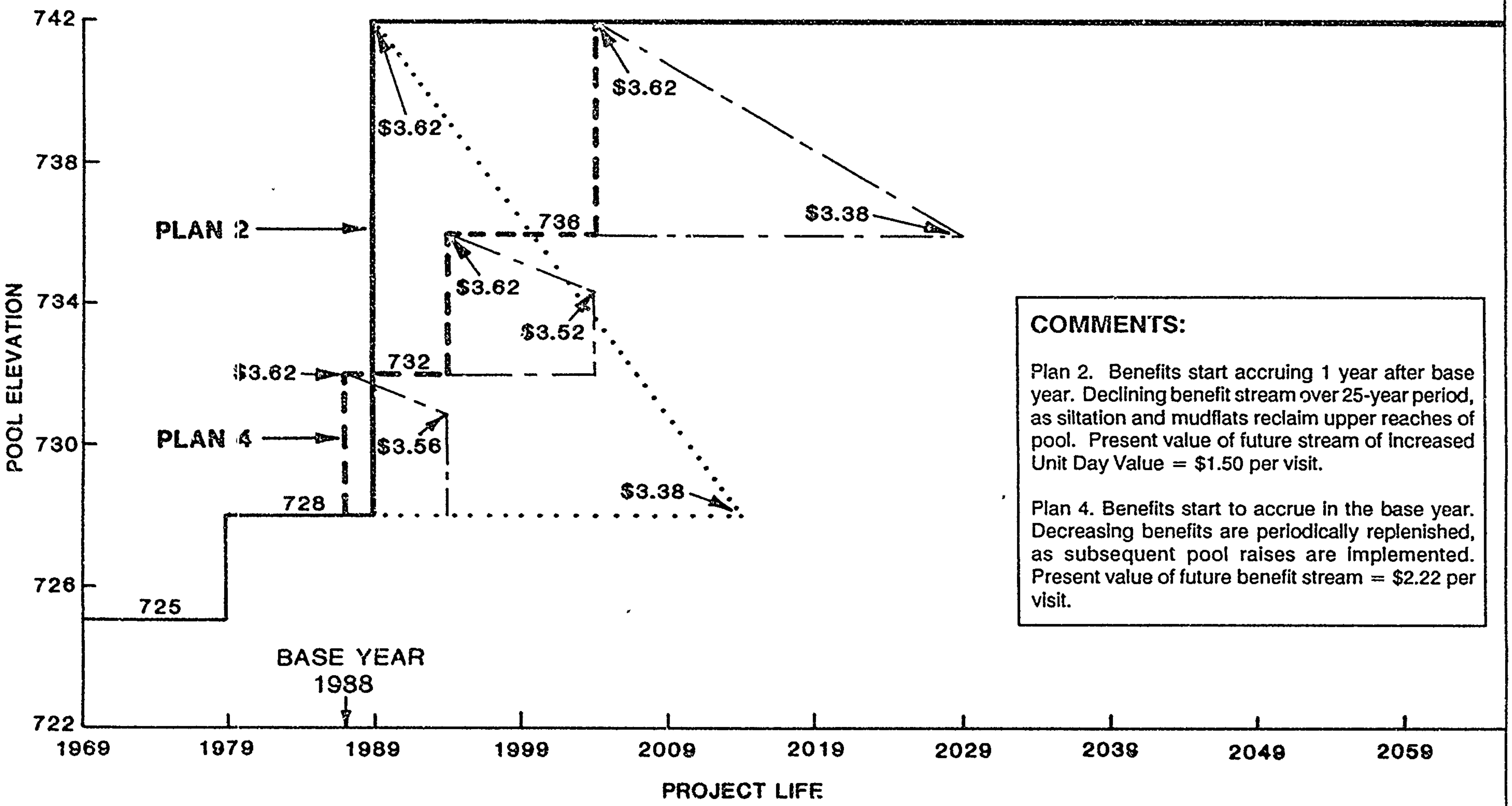
NOISE LEVELS

With each of the alternatives, construction machinery would generate a temporary increase in noise during construction. This increase might disturb recreationists at Lake Red Rock. However, no sensitive receptors (e.g., schools) are located near the recreation sites that would require relocation, and, therefore, no significant impacts would be expected.



POOL RAISE ALTERNATIVES
TIMING AND ELEVATIONS
POOL ELEVATION
742
738
734
730
726
722
PROJECT LIFE
1969
1979
1989
1999
2009
2019
2029
2039
2049
2059
PLAN 2
PLAN 3
PLAN 4
PLAN 7
BASE CONDITION
&
ALTERNATIVE 1
725
728
732
733
734
736

PLATE F-1



COMMENTS:

Plan 2. Benefits start accruing 1 year after base year. Declining benefit stream over 25-year period, as siltation and mudflats reclaim upper reaches of pool. Present value of future stream of increased Unit Day Value = $1.50 per visit.

Plan 4. Benefits start to accrue in the base year. Decreasing benefits are periodically replenished, as subsequent pool raises are implemented. Present value of future benefit stream = $2.22 per visit.

COMPARISON OF ALTERNATIVES
ESTHETIC BENEFIT - MUDFLAT COVERAGE
8 5/8% DISCOUNT RATE

PLATE F-2

SITE PLANNING

APPENDIX G

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX G
SITE PLANNING

TABLE OF CONTENTS

List of Tables

List of Plates

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX G
SITE PLANNING

INTRODUCTION

An increase in the elevation of the Lake Red Rock conservation pool would have an impact on federally owned bridges and recreational facilities. The Corps of Engineers would either relocate or modify two beaches, one boat ramp, one parking lot, and one bridge. The impacts first occur between elevations 735 and 739 feet National Geodetic Vertical Datum (NGVD). Construction for the listed facilities would be at 100-percent Federal expense.

NORTH OVERLOOK BEACH

North Overlook beach is located near the dam on the north side of Lake Red Rock (plate G-1). The facility becomes unserviceable at elevation 739 feet NGVD. The new beach would be placed just upstream of the existing area on high ground. A new parking lot would be located adjacent to the new beach on the east side (see plate G-2). Itemized improvements are listed in table G-1.

TABLE G-1

Costs for North Overlook Beach
Lake Red Rock, Iowa

Item	Quantity	Unit	Unit Cost ($)	Federal Cost ($)
Parking lot				
Grading	2,400	yd3	5.00	12,000
Drainage excavation	325	yd3	4.00	1,300
3" ACC, 6" base	7,300	yd3	18.00	131,400
Access road	300	LF	65.00	19,500
Drainage culverts	1	job	sum	5,000
Beach				
Grading	4,500	yd3	3.00	13,500
Sand	6,300	ton	3.00	18,900
Vault toilet	1	job	sum	20,000
Remove existing pavement	3,400	yd2	4.00	13,600
			Subtotal -	235,200
			Contingencies (25%) -	58,800
			Subtotal -	294,000
			Engineering and Design (7%) -	20,600
			Supervision and Administration (5.5%) -	16,200
			Total -	330,800

EAST WALLASHUCK BOAT RAMP

East Wallashuck boat ramp is located about 1 mile upstream of the dam on the north side of Lake Red Rock. The ramp becomes unserviceable at elevation 738 feet NGVD. The new boat ramp would be built off the existing parking lot access road. The new parking lot would be located on high ground near the south end of the camping area (see plate G-3). Itemized improvements are listed in table G-2.

TABLE G-2

Costs for East Wallashuck Boat Ramp
Lake Red Rock, Iowa

Item	Quantity	Unit	Unit Cost ($)	Federal Cost ($)
Concrete ramp	1	job	sum	65,000
Boatway	1	job	sum	85,000
Parking lot				
Grading	2,400	yd3	5.00	12,000
Drainage excavation	325	yd3	4.00	1,300
3" ACC, 6" base	7,300	yd2	18.00	131,400
			Subtotal -	294,700
			Contingencies (25%) -	73,700
			Subtotal -	368,400
			Engineering and Design (7%) -	25,800
			Supervision and Administration (5.5%) -	20,300
			Total -	414,500

WEST WALLASHUCK PARKING LOTS

West Wallashuck is located about 1 mile above the dam on the north side of Lake Red Rock. The lowest level of the parking lot becomes unserviceable at elevation 735 feet NGVD. There currently exists a connection between the lower and middle parking lots. A connecting drive would be installed between the middle and upper levels of the parking lot when the lower level becomes unserviceable (see plate G-4). Itemized improvements are listed in table G-3.

TABLE G-3

Costs for West Wallashuck Parking Lots
Lake Red Rock, Iowa

Item	Quantity	Unit	Unit Cost ($)	Federal Cost ($)
Access road	150	LF	65.00	9,800
			Contingencies (25%) -	2,500
			Subtotal -	12,300
			Engineering and Design (7%) -	900
			Supervision and Administration (5.5%) -	700
			Total -	13,900

WHITEBREAST BEACH AND BOAT RAMP

Whitebreast beach is located 1-1/2 miles upstream of the dam on the south side of Lake Red Rock. The beach becomes unserviceable at elevation 739 feet NGVD. There are three boat ramps on Whitebreast Point. Lakeview and Whitebreast Heights boat ramps are unserviceable, and Coal Ridge boat ramp is fully serviceable from elevations 728 to 735 feet NGVD, is marginally serviceable from elevations 736 to 738 feet NGVD, and becomes unserviceable at elevation 739 feet NGVD. The Coal Ridge boat ramp will be abandoned upon completion of the new Whitebreast Meadows boat ramp.

A new natural sand beach would be developed to the east of the existing beach. Support facilities would include a beach house and a 125-car parking lot. A new 2-lane boat ramp, designated Whitebreast Meadows, would be located north of the new beach. There would be 15 car and trailer, and 60 car and trailer parking lots adjacent to the ramp, along with an access road which would connect to the existing park road. The beach and boat ramp would be connected by an 8-foot paved bicycle trail and there would be a small earthen dam for a fishing pond (plate G-5). Itemized improvements are listed in table G-4.

TABLE G-4

Costs for Whitebreast Beach and Boat Ramp
Lake Red Rock, Iowa

Item	Quantity	Unit	Unit Cost ($)	Federal Cost ($)
Beach				
Parking lot				
Grading	1,300	yd3	5.00	6,500
3" ACC, 6" base	3,900	yd2	18.00	70,200
Entrance access road	50	LF	70.00	3,500
Beach development				
Maintenance access road	400	LF	30.00	12,000
Concrete wall	195	yd3	300.00	58,500
Excavation, wall	520	yd3	5.00	2,600
Fill, wall	2,600	yd3	5.00	13,000
Comfort station/ changehouse	1	job	sum	174,800
Sidewalks	2,400	ft2	4.00	9,600
Bike trail	1,600	LF	32.00	51,200
Fill, trail	7,000	yd3	5.00	35,000
Boat ramp				
Existing access road removal	4,200	yd3	6.00	25,200
Riprap	1,500	ton	24.00	36,000
Access road	850	LF	65.00	55,250
Parking lot				
Grading	1,400	yd3	5.00	7,000
3" ACC, 6" base	4,200	yd2	18.00	75,600
Rigging area				
Grading	400	yd3	5.00	2,000
3" ACC, 6" base	1,200	yd2	18.00	21,600
Ramp with boatway	1	job	sum	150,000
			Subtotal -	809,600
			Contingencies (25%) -	202,400
			Subtotal -	1,012,000
			Engineering and Design (7%) -	70,800
			Supervision and Administration (5.5%) -	55,700
			Total -	1,138,500

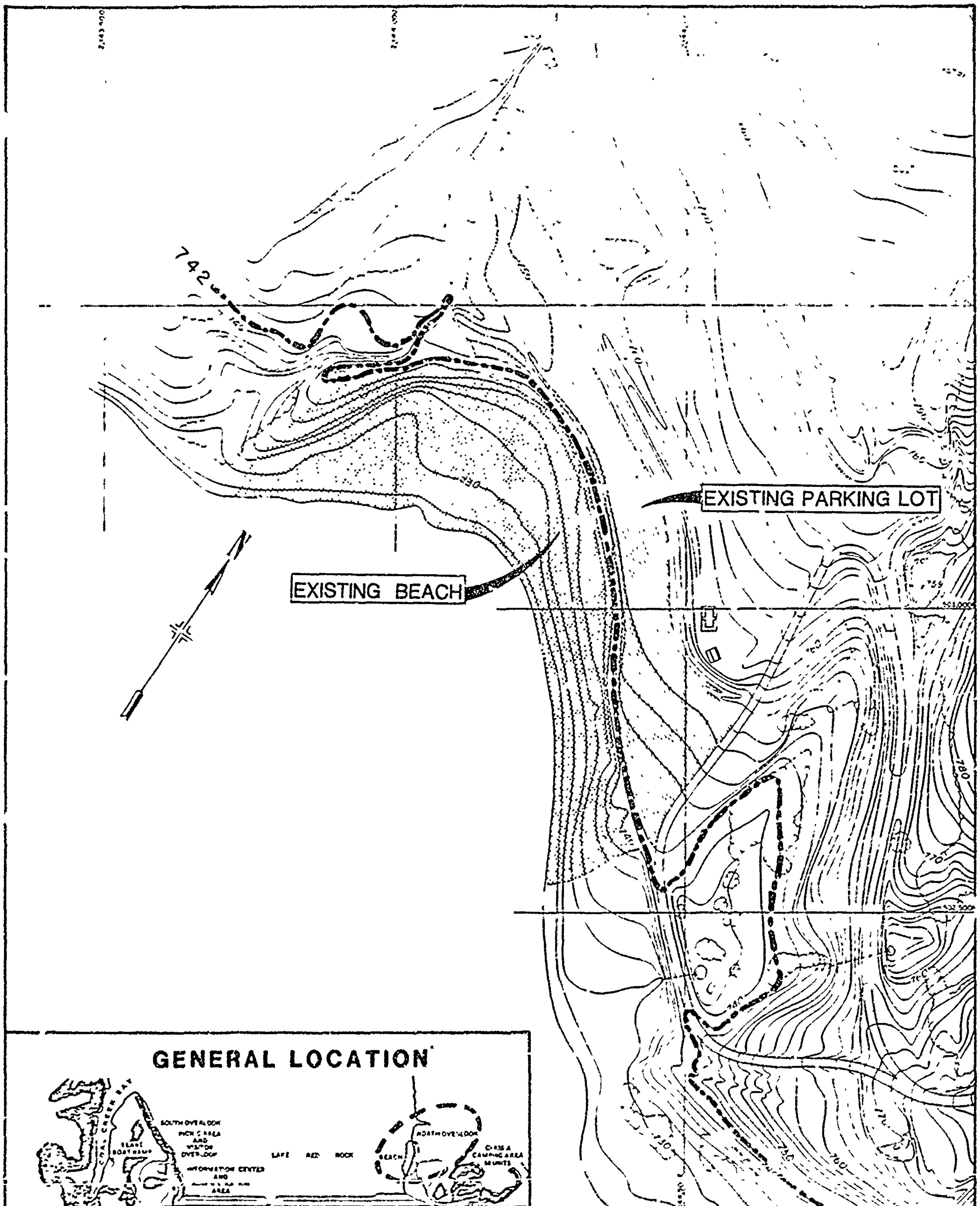
BRIDGE NO. 70274910

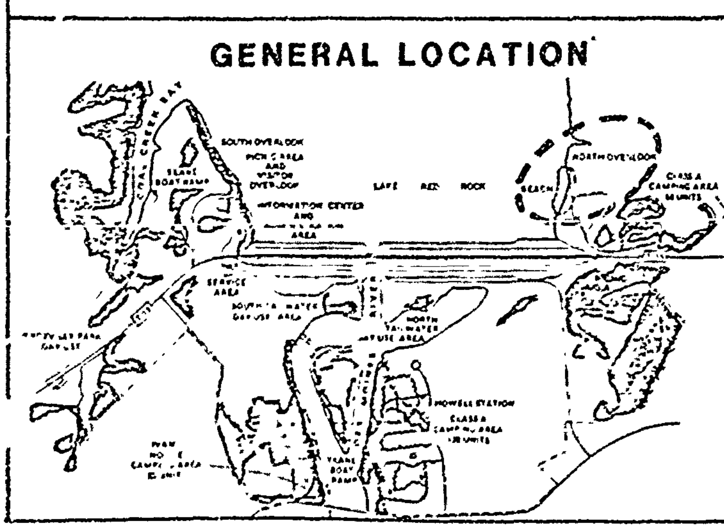
Bridge No. 70274910 is located 2 miles north of the State Highway 14 Bridge on the north side of Lake Red Rock. The structure becomes unserviceable at elevation 735 feet NGVD. The bridge is lightly utilized and will be removed. Itemized improvements are listed in table G-5.

TABLE G-5

Costs for Removing Bridge No. 70274910
Lake Red Rock, Iowa

Item	Quantity	Unit	Unit Cost ($)	Federal Cost ($)
Remove bridge	1	job	sum	10,000
			Contingencies (25%) -	2,500
			Subtotal -	12,500
			Engineering and Design (7%) -	900
			Supervision and Administration (5.5%) -	700
			Total -	14,100

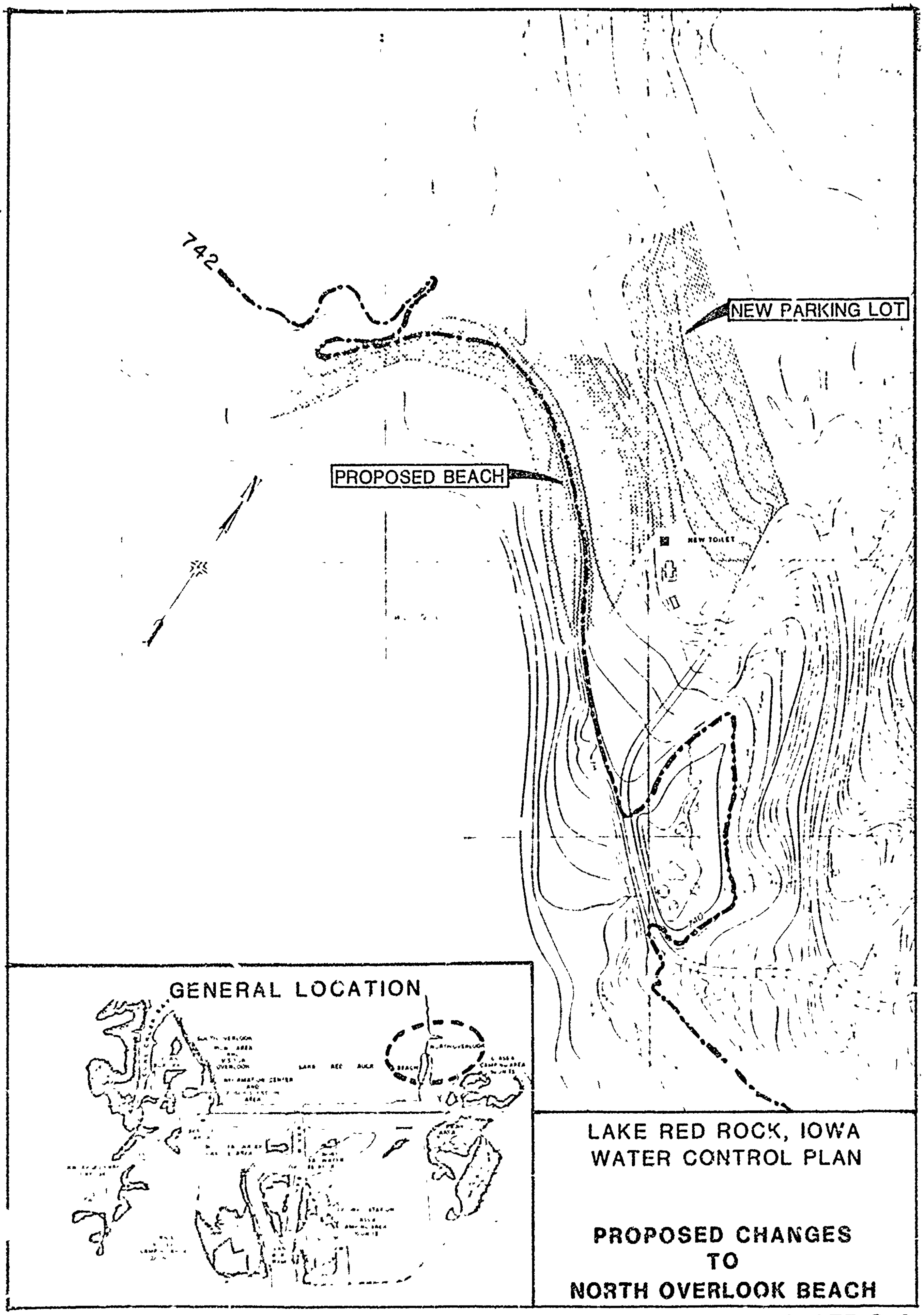




LAKE RED ROCK, IOWA
WATER CONTROL PLAN

EXISTING CONDITIONS
(5-7-87)
NORTH OVERLOOK BEACH

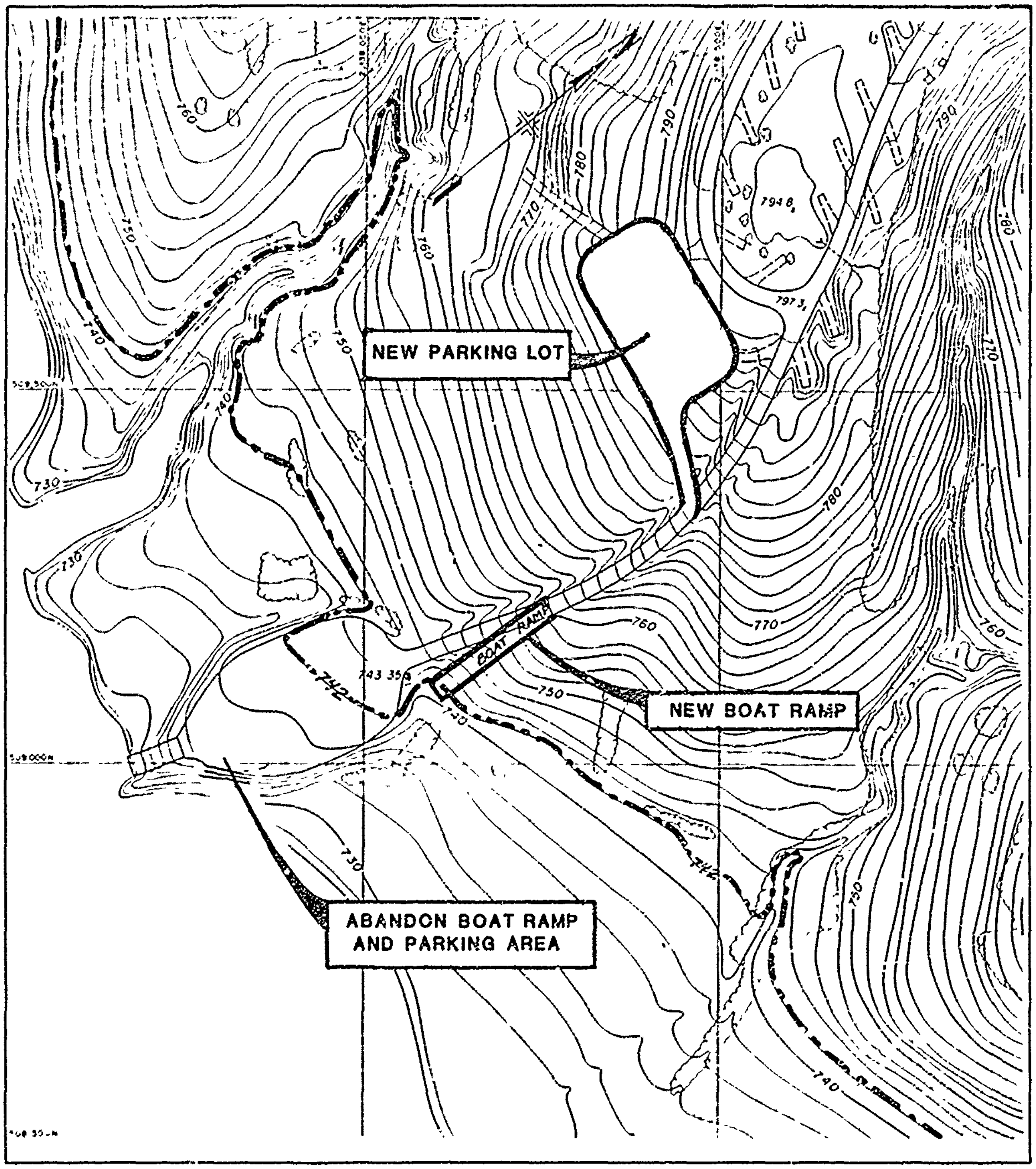
PLATE G-1

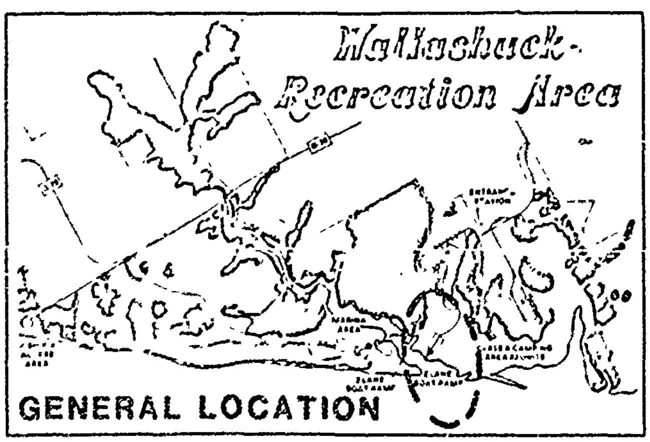


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES TO NORTH OVERLOOK BEACH

PLATE G-2

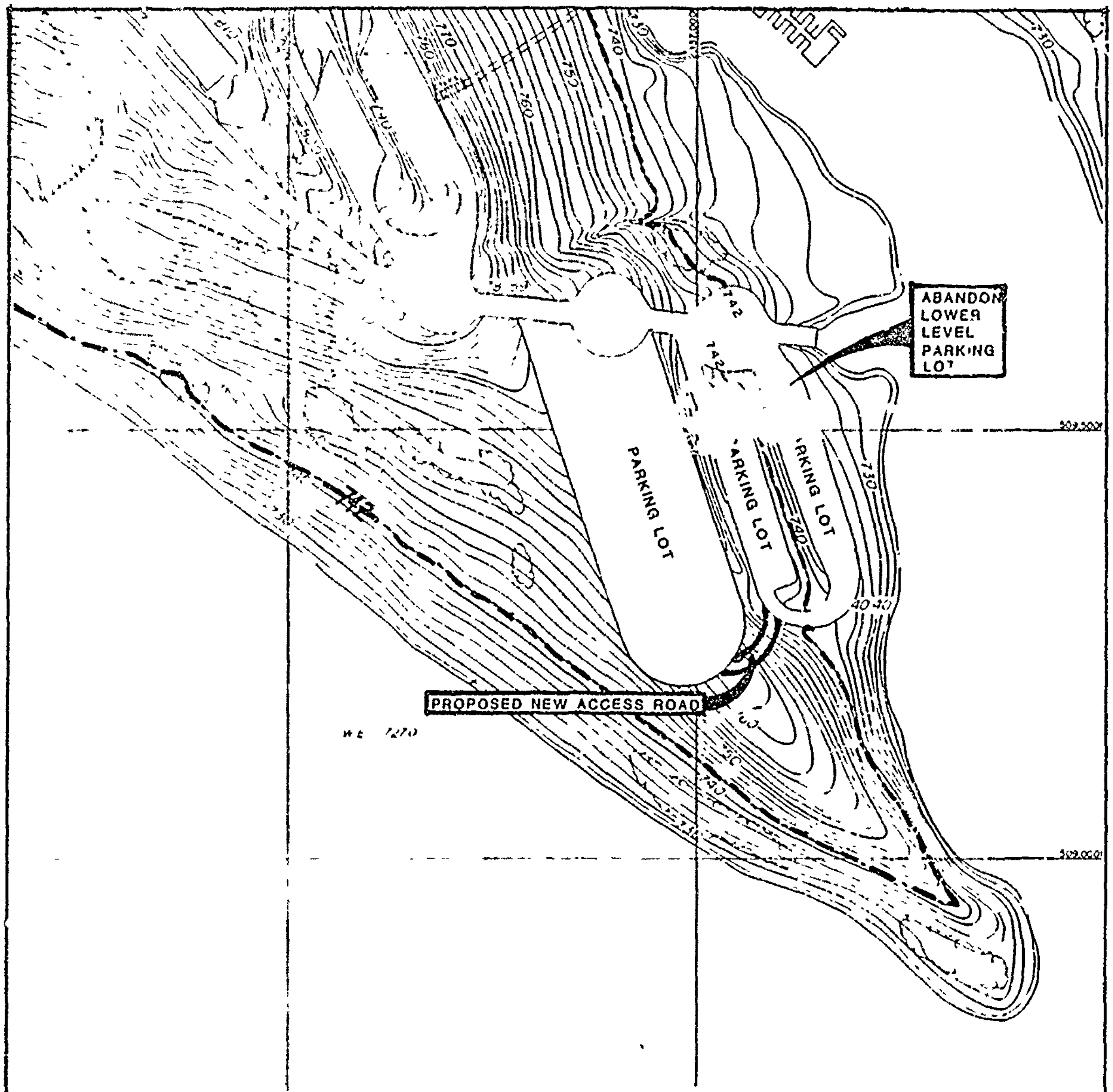


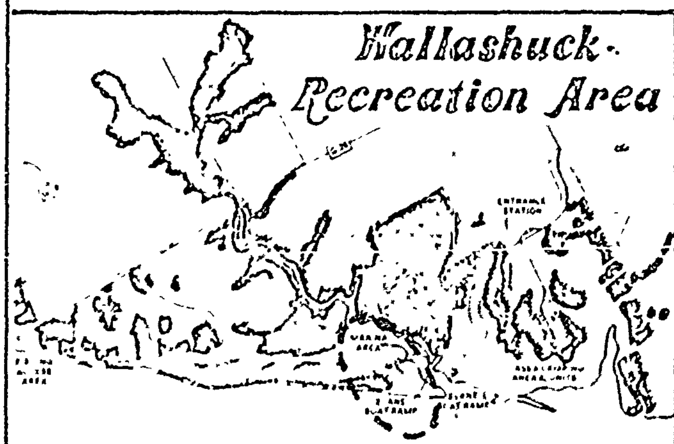


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES
TO
EAST WALLASHUCK

PLATE G-3



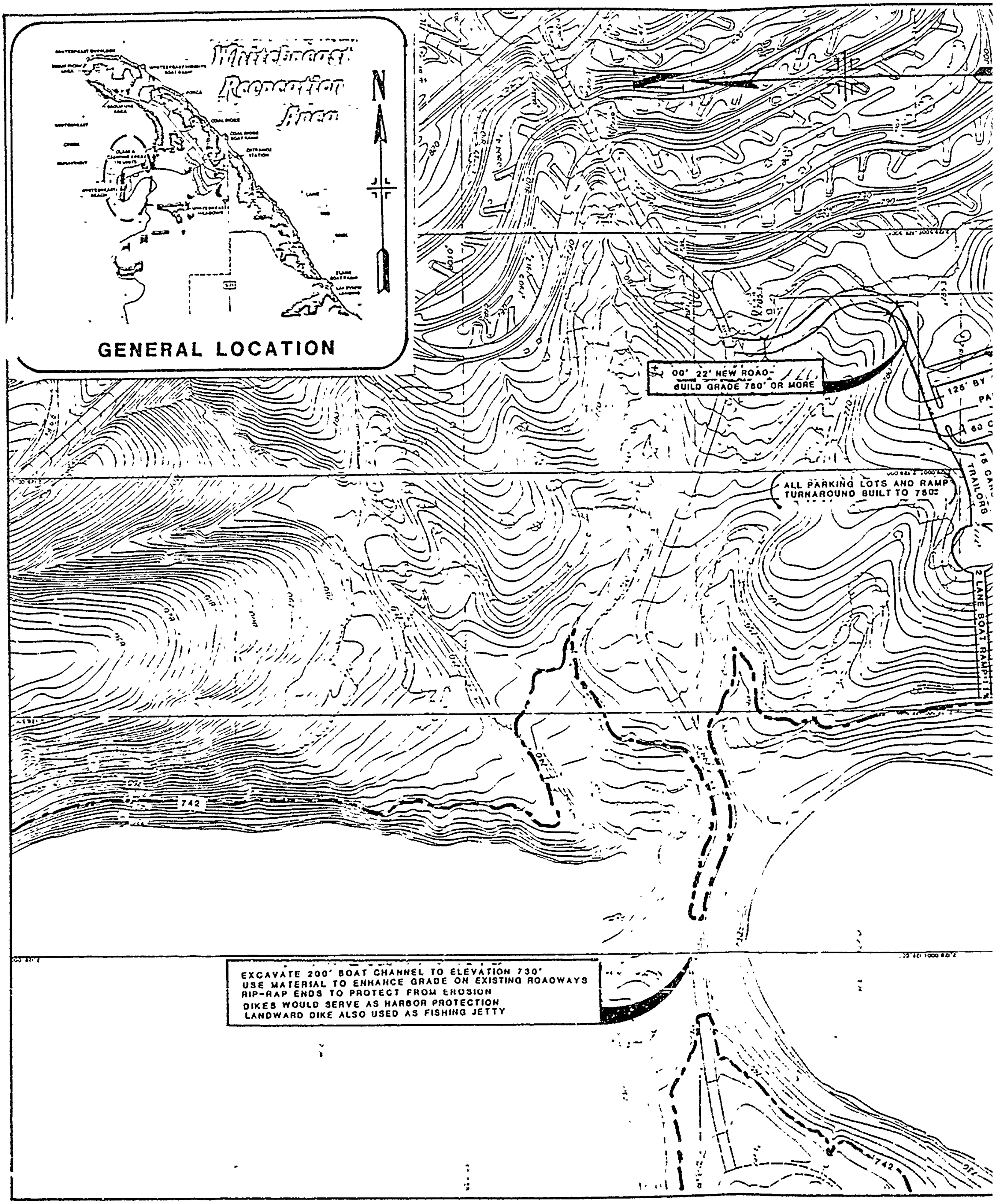


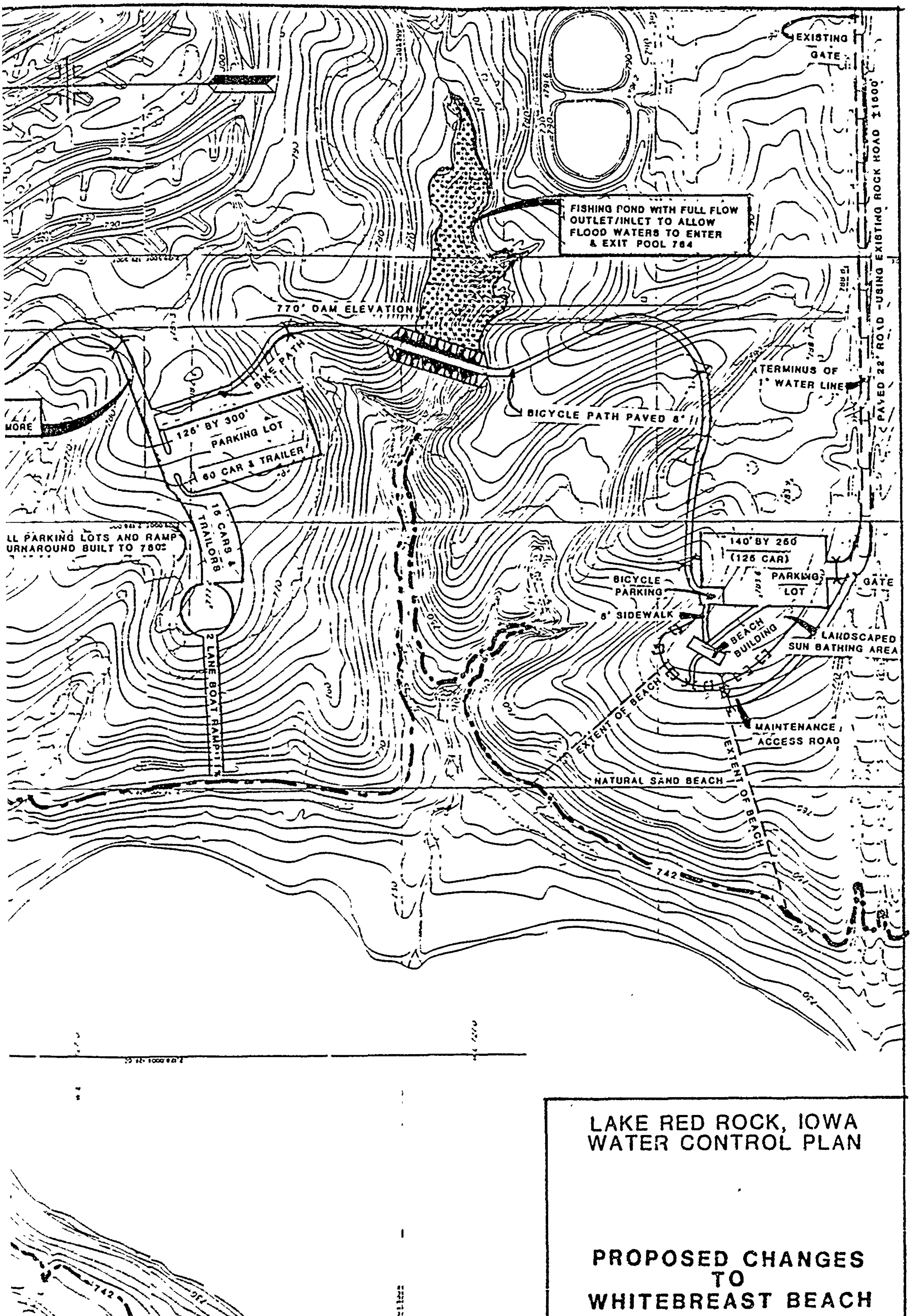
GENERAL LOCATION

LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES TO WEST WALLASHUCK

PLATE G-4


GENERAL LOCATION
00' 22' NEW ROAD-
BUILD GRADE 780' OR MORE
ALL PARKING LOTS AND RAMP
TURNAROUND BUILT TO 780±
2 LANE BOAT RAMP
742
EXCAVATE 200' BOAT CHANNEL TO ELEVATION 730'
USE MATERIAL TO ENHANCE GRADE ON EXISTING ROADWAYS
RIP-RAP ENDS TO PROTECT FROM EROSION
DIKES WOULD SERVE AS HARBOR PROTECTION
LANDWARD DIKE ALSO USED AS FISHING JETTY



LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES TO WHITEBREAST BEACH

PLATE G-5

PUBLIC INVOLVEMENT

APPENDIX H

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX H
PUBLIC INVOLVEMENT

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX H
PUBLIC INVOLVEMENT

GENERAL

Public involvement is designed to create awareness and to stimulate interest in an active Corps of Engineers study. Its purpose is to encourage two-way communication and public participation in the planning and decision-making process of the study. The major objectives of the public involvement program for the Water Control Plan for Lake Red Rock are to:

a. Continually identify affected and interested individuals and groups within the study area;

b. Be responsive to the level of interest and concern expressed by the public; and

c. Keep the public involvement program visible and understood by the participants.

PUBLIC INVOLVEMENT ACTIVITIES

The Corps of Engineers maintains an updated distribution list for each project study. This list is comprised of affected or interested parties, including Federal, State, regional, and local governmental entities and officials, public and private organizations, and individuals. In an effort to keep the public informed about the Lake Red Rock Water Control Plan study progress, the Corps of Engineers has communicated information in the following ways:

a. A Public Information Fact Sheet, dated January 31, 1985, discussed the preparation and contents of a Lake Red Rock operation report and the need to raise the conservation pool from elevation 728 to 742 feet NGVD. Notices were sent that public meetings would be held in the future with information on dates, times, and locations.

b. A March 1985 study update report, entitled Alternatives to the Regulation of Lake Red Rock, discussed the Lake Red Rock background and explained the four alternatives being considered for raising the conservation pool from elevation 728 to 742 feet NGVD. The public was encouraged to fill out comment sheets attached to the report.

c. A brochure announcing the times and locations of the March 26 and 27, 1985, public workshops was mailed to those persons on the Lake Red Rock distribution list. Persons desiring a copy of the Alternatives to the Regulation of Lake Red Rock report were invited to request a copy.

d. Public workshops were held on March 26, 1985, (one workshop) and March 27, 1985, (two workshops). The purpose of these workshops was to discuss with the concerned public the alternative plans for raising the pool elevation of Lake Red Rock. The workshops were well attended. The comments received at the workshops and later through the mail centered around the following areas of concern: (1) recreation potential; (2) erosion/regulation impacts; (3) easement impacts; and (4) water supply effects/hydropower potential. These comments were taken into consideration during our studies. Also, the Lake Red Rock distribution list was expanded to include the people who expressed an interest at the public workshops.

e. A November 1985 study update, entitled Alternatives to the Regulation of Lake Red Rock, concentrated on the concerns and views expressed by recreational interests. The current status of the Lake Red Rock study also was discussed.

f. A February 1986 study update, entitled Alternatives to the Regulation of Lake Red Rock, focused on the subject of flowage easements (a concern of many people at the March 1985 public workshops), questions concerning the current operation of Lake Red Rock, and the current study status.

g. The most recent Alternatives to the Regulation of Lake Red Rock study update, dated October 1986, discussed the last two of the four categories of comments received from the March 1985 public workshops: erosion/regulation impacts and water supply effects/hydropower potential. The current study status was reviewed, along with a discussion of easement land acquisition. It was announced that public meetings would be held in the spring of 1987.

h. The draft Water Control Plan was distributed for a 45-day public review on June 22, 1987. Copies of the draft report or a Notice of Availability were sent to over 550 persons. Letters of comments are found in the Public Review Comment and Response section.

i. A public meeting was held on July 7, 1987, at Central College in Pella. Iowa. Over 400 persons attended the meeting at which the Rock Island District Engineer presented a proposal to raise the conservation pool to elevation 736 feet NGVD. Comments were received from Federal, State and local officials, area residents, landowners, and the general public.

j. A Project Report Update was distributed to the public on October 28, 1987. The report includes a change in the District Engineer's recommendation for a conservation pool raise to elevation 734 feet NGVD. (The previous recommendation was for a conservation pool raise to elevation 736 feet NGVD.) The recommendation was modified in consideration of the comments received during the draft Water Control Plan public review period. Letters of comment on the new alternative are found in the Pertinent Correspondence appendix.

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

October 28, 1987

PROJECT REPORT UPDATE
FOR
DRAFT WATER CONTROL PLAN
WITH
DRAFT SUPPLEMENTAL ENVIRONMENTAL
IMPACT STATEMENT

LAKE RED ROCK, IOWA

This project report update is in reference to the final Water Control Plan (WCP) and final Supplemental Environmental Impact Statement (SEIS) for Operation and Maintenance at Lake Red Rock, Iowa.

A draft WCP and draft SEIS were released to the public in July 1987. The alternatives examined were as follows: (1) maintain present operation; (2) maintain present operation with improved discharge rates; (3) one-step pool raise to elevation 742 feet NGVD; (4) two-step pool raise - first to elevation 736 feet NGVD and then to elevation 742 feet NGVD; (5) three-step pool raise - first to elevation 732 feet NGVD, then to elevation 736 feet NGVD and finally to elevation 742 feet NGVD; (6) dry pool; and (7) dredging.

In the draft report, we recommended that the permanent conservation pool at Red Rock Reservoir be established at elevation 736 feet NGVD as soon as practicable. We further recommended that actions be planned and executed so as to permit raising of the permanent conservation pool to elevation 742 feet NGVD in the year 1999, with the understanding that a final decision to execute the latter raise will be subject to a public review and confirmation by the District Engineer responsible for management of the project at that time.

We also recommended in the draft WCP that a seasonal fall pool raise study be carried out expeditiously in order to be responsive to the concerns of the State of Iowa.

Upon further consideration of the public and agency concerns expressed during the review of the draft report, we are changing our recommendation for a conservation

raise to elevation 734 feet NGVD as soon as practicable and a future pool raise to elevation 742 feet NGVD in accordance with an agreement yet to be established between the Federal Government and the State of Iowa. (For analytical purposes, the future pool raise to 742 will be projected to occur in the year 1999).

The draft report was distributed for public review during July and August 1987. The draft SEIS contained supplemental information to the Final Environmental Impact Statement for Operation and Maintenance of Red Rock Dam and Lake Red Rock, Des Moines River, Iowa. The final document, filed with the Council on Environmental Quality on August 24, 1976, addressed the following activities: (a) maintaining controlled discharges to prevent downstream flooding; (b) periodic structure repair and landscaping; (c) maintaining seven recreation facilities located on the periphery of the lake; (d) mowing lawns in grass-covered areas during the spring, summer, and fall; (e) removing debris, e.g. fallen trees and limbs, periodically from recreation areas; (f) maintaining roads on Corps of Engineers property to permit smooth traffic flow; (g) routinely cleaning catch basins, drains, and drainage ditches; (h) maintaining launching ramps, swimming beaches, signs and trails, in an orderly manner; (i) routinely removing solid wastes generated by visitors to Lake Red Rock from the administration building and recreation areas; (j) managing and maintaining the wildlife management area by the Iowa Conservation Commission (now the Iowa Department of Natural Resources); and (k) carrying out a forest management program by the Corps of Engineers to preserve, improve, and maintain healthy trees and cover. Since the filing of the document in 1976, there have been no substantial changes in the aforementioned activities.

The final Supplemental Environmental Impact Statement will address the changes in operation and maintenance resulting from the conservation pool raise from 728 feet NGVD to its 100-year design life elevation of 742 feet NGVD. With the exception of the pool level and cultural resources, the impacts presented in the draft SEIS remain unchanged.

All pool raise alternatives considered in the study lead to an elevation of 742 feet NGVD (projected 100-year conservation pool level). Thus, the ultimate habitat conversion impacts are similar for all conservation pool raise alternatives. The aquatic resources in the lake would be expanded at the expense of periodically flooded

terrestrial habitat. Boating and aesthetics will be enhanced until mudflats are re-established in the upper reaches of the lake. Relocation of recreational facilities will not be required for the elevation 734 feet NGVD pool as discussed in the draft report. Flood frequencies and sedimentation rates will not be significantly different than for the elevation 736 feet NGVD conservation pool. Impacts to other resources would be minimal.

The elevation 734 feet NGVD conservation pool will have an initial surface area of about 11,000 acres. This amounts to about 2,500 acres less than would be present at elevation 736 feet NGVD. In comparison, the existing conservation pool at elevation 728 feet NGVD has about 6,875 surface acres.

We have taken appropriate measures to ensure that significant historic properties are identified prior to a pool raise, and we are completing a National Register of Historic Places evaluation of the lake. Ninety-two potentially significant sites have been (or are being) evaluated between elevations 728 and 742 feet NGVD. Four sites below elevation 740 feet NGVD have been determined as significant. We are working with the Iowa State Historic Preservation Officer and the Advisory Council on Historic Preservation to provide for mitigation work prior to a pool raise.

The major item of public concern identified during the draft review period involves the impact upon flooding of upstream easement lands and downstream flooding and erosion. The change in flood frequencies will not be significant with the recommended plan. Downstream erosion is a naturally occurring process and no significant differences are predicted to occur by a change in the release rates of the dam.

Please provide comments within 30 days of the date of this letter. Unless altered by the comments received, the District will proceed with preparation of the Final Supplemental Environmental Impact Statement reflecting the above referenced preferred alternative. The proposed schedule is as follows:

Public Coordination of Preferred Alternative	October-December 1987
Corps of Engineers Review and Approval	January-February 1988

Public Coordination of Final Report and Supplemental EIS	March-April 1988
Raise Conservation Pool	May 1988

This project report update is being mailed to persons who received the draft Water Control Plan Report, to persons who attended the public meeting in Pella, Iowa, on July 7, 1987, and to persons who have commented on the draft report.

If you have any questions on the Water Control Plan, please call Mr. George Gitter at 309/788-6361, extension 214. Questions regarding the Supplemental Environmental Impact Statement may be directed to Mr. Bob Clevenstine at extension 386. Comments may be sent to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Lowdell Taylor
L & A Food Stores, Inc.
718 Broadway
Pella, Iowa

Rock Island Corps of Engineers
Rock Island, Illinois

Dear Sirs:

I whole heartedly support the raise in Lake Red Rock water level. Without a raise recreation on the lake will continue to dwindle until there is none. As a boater, hunter, fisherman and retailer in Pella, I would not like to see the advantages of Lake Red Rock disappear.

Also, I would like to see the corp stop leasing land to farmers for grain production, when the government is paying farmers to cut production. The land could be better used for wildlife and public use as public land is short enough in Iowa.

Thank you for your consideration.

Sincerely yours,

Lowdell Taylor, President
L & A Food Stores, Inc.
718 Broadway
Pella, Iowa 50219

1. Noted.

2. Lands at Lake Red Rock are leased by the Iowa Department of Natural Resources and the Corps of Engineers, primarily for fish and wildlife management. The Iowa Department of Natural Resources manages about 27,000 acres which, in turn, are leased for farming. This provides income for the State to be used for wildlife management, and provides food and cover for wildlife.

3. Corps leased agricultural lands also provide an income to the State. Of the rents collected by the Corps on its leases, 75-perccent are returned to the State to be expended for the benefit of public schools and roads in the county in which the property is located or for defraying expenses of the county government, including public obligations of levee and drainage districts for flood control and drainage improvements. Leasing also promotes the economy, maintains property, and prevents undesirable vegetation.

KENNETH G. FREEMAN
Regional Sales Manager
~~608 Patty Drive~~
Knoxville, Iowa 50138
106 E. Montgomery

WALSWORTH
PUBLISHING COMPANY
YEARBOOK MANUFACTURERS

In 50 States and 25 Foreign Countries / 306 NORTH KANSAS AVE., MARCELINE, MISSOURI 64658 / 816:376-3543

June 29, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building P.O. Box 2004
Rock Island, Illinois 61204 - 2004

Dear Sirs:

I was the first and second president of the Red Rock Lake Association, and was very active in trying to achieve the goal of a fine recreation area as well as a flood control lake.

My heart has been broken several times in the past years, because I believe the management of the lake from Rock Island or Chicago has been of a nature that did not seem to show sincerity to the many boaters, fishermen and the millions of users of the area.

1 Even though it is nearly too late (due to silting) and long overdue, PLEASE RAISE THE PERMANENT POOL 8 feet or more, to try to save a small part of what might have been a great advantage to the economic community of the area.

Yours truly,

Kenneth G. Freeman

Kenneth G. Freeman

1. Noted.

Iowa
State Historical Department

East 12th and Grand Avenue, Des Moines, Iowa 50319
(515) 281-5111

June 29, 1987

Col. Neil A. Smart
District Engineer
Rock Island District Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

RE: DRAFT WATER CONTROL PLAN WITH DRAFT SUPPLEMENTATAL ENVIRONMENTAL IMPACT STATEMENT, LAKE RED ROCK, IOWA.

Dear Col. Smart:

1 I have reviewed the above referenced report and concur with the comments prepared by COE staff as to the effects of the five alternatives on cultural resources. The Rock Island staff has worked closely with our Office on this project and has responded to all concerns and recommendations for identification and evaluation studies. We look forward to reviewing proposed data recovery plans and to the Programmatic Agreement to mitigate the adverse effects of the pool raise.

Sincerely,

Kay Simpson

Kay Simpson
Compliance and Archeological Survey

cc: Dudley Hanson, COE

1. Noted. We have initiated mitigation of 3 sites and will continue our ongoing coordination with the State.

JOHNSTON, HICKS & QUITER
ATTORNEYS AT LAW
KNOXVILLE, IOWA 50138

June 30, 1987

TO WHOM IT MAY CONCERN:

I am an interested person as an attorney who represented property owners within the Lake Red Rock Impact Area at the time of original acquisition and at this time.

At the time of acquisition of flowage easements, we were told that the permanent conservation pool would be at an elevation of 725 feet. Statistical data was furnished to owners whose property was to be periodically flooded. This data was used by appraisers for the owners to determine just compensation for their flowage easements.

The frequency and duration of the flooding of the flowage easement land has far exceeded the expectations of the property owners based upon data furnished them.

As a result of the more frequent and longer periods of flooding, property owners were not adequately compensated for the easements given. The flooding has caused excess flooding of crop ground and has reduced the value of their land more than contemplated.

Any change in the elevation of the permanent conservation pool will have a severe environmental impact on the use of the flowage easement area because of the reduced capacity of the storage area.

The extension of the non-growing season from April 20 to April 30 will also adversely affect the environmental impact on the property subject to flowage easement.

QUESTIONS

1 1. Based upon current surveys, how many acre feet have been lost from storage by sedimentation?

2 2. Based upon the estimated sedimentation predicted to occur in the future, how many acre feet of storage will be lost each year?

3 3. How has actual sedimentation of the lake compared with predicted sedimentation made prior to construction of the dam and how has this affected the statistical data originally furnished to property owners?

4 4. How will increasing the "maximum crop season" releasing from 18,000 cu.ft./sec. to 22,000 cu.ft./sec. affect the crop acres below the dam?

5 5. How will the extension of the "non-growing season" affect the crop acres below the dam?

6 6. Will property owners either above or below the dam be compensated for adverse effect of change of control plan?

I will be unable to attend the July 7th meeting, but would appreciate consideration of the comments herein contained and answers to the questions asked.

Very truly yours,

Joseph H. Johnston

JHJ·jmk

1. Based upon 1984 surveys, approximately 79,650 acre-feet of storage has been lost due to sedimentation.

2. Based upon our sedimentation estimates, we predict that, on the average, 4,000 acre-feet of storage will be lost each year.

3. Actual sedimentation rates (5,000 acre-feet/year) have been slightly higher than original predictions (4,000 acre-feet/year). however, the sedimentation experienced in the years following construction includes initial high erosion resulting from adjustment to new land uses and unusually high rainfall. Sedimentation, itself, has not affected the statistical data furnished to property owners.

4. Increasing the "maximum crop season" releases from 18,000 cubic feet per second to 22,000 cubic feet per second (but only when the pool is above elevation 760 feet NGVD) will shorten the duration of downstream flooding. Between 3,500 and 4,000 acres of recently cleared timber and marginal farmland will be affected, mainly by river water influencing ground water levels.

5. Extension of the "nongrowing season" should benefit crop acres below the dam by reducing the flood risk during the "growing season." During periods of heavy runoff, the additional water released will allow for storage of future floods.

6. The pool raise plan does not include compensation for either downstream or upstream landowners. It is our position that our acquisition of upstream flowage easements represents the extent of our obligation to compensate landowners at Lake Red Rock.

JIM LIGHTFOOT
5th District Iowa

1609 Longworth Building
Washington DC 20515
(202) 225-3806

Committee on Public Works
and Transportation

Committee on Government Operations

Select Committee on Aging

Rural Communities
Task Force

Congress of the United States
House of Representatives

District Offices
[illegible]
Shenandoah IA [illegible]
[illegible]

[illegible] Pearl Street
Council Bluffs IA [illegible]
[illegible]

[illegible]
[illegible]
[illegible]

[illegible] Plaza
Fort Dodge IA [illegible]
[illegible]

District Toll Free Line
1-800-[illegible]

July 1, 1987

Colonel William C. Burns
District Engineer
Rock Island District, Corps of Eng.
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

Please find enclosed a copy of a letter from the Marion County Board of Supervisors regarding its desire to acquire complete control over Roberts Lake and operate it separately from Lake Red Rock.

1 I can understand the Board's concern over the impact of Lake Red Rock operations on Roberts Lake. In that regard, I would appreciate your sharing with me your views on this request. If a transfer of this type would require congressional action, please describe what action would be necessary.

Thank you for your time and consideration. Your cooperation in this matter will be appreciated.

Sincerely,

Jim Lightfoot

JIM LIGHTFOOT
MEMBER OF CONGRESS

JRL/tb

Enclosure

1. Noted. Comments are addressed on the following pages.

INFORMATION ON THE PROBLEMS WITH RED ROCK RESERVOIR AND ROBERTS CREEK LAKE

(1) The Marion County Conservation Board, which leases Roberts Creek Lake from the Corps of Engineers, would like to have the lake under its complete control and removed from its current status as a sub-impoundment lake for the Red Rock Reservoir.

(2) When the Red Rock Reservoir was built, the Corps stated that the Roberts Creek Lake storage area would only be needed once every 10 years or so. As a result of this assurence, the Conservation Board began stocking the lake with different kinds of fish for recreational fishing, built a very nice sand beach with bathhouses and concession stand for swimmers and sunbathers, and built one of the nicest campgrounds in this part of the state.

(3) The Corps' forecast of the number of times water would back up from Red Rock Reservoir into Roberts Lake was so far off that concerned people in this area no longer have confidence in its judgment. Since the Red Rock Dam was completed, Red Rock has averaged more than once each year backing into Roberts Creek Lake. And in 1986, this occurred three times. The Corps of Engineers states that the Red Rock pool level was above 750 feet (the level where it begins backing into Roberts Creek Lake) from May 17 to June 15, 1986, from July 12 to July 21, 1986, and from Oct. 31 to Nov. 21, 1986.

(4) This action has almost completely ruined fishing, seriously affected swimming and sunbathing, and has made the campgrounds far less attractive. The Conservation Board has stopped all stocking of fish at Roberts Creek Lake as all of its efforts have been futile. Almost every year it has also had to spend considerable effort and money rebuilding the beach.

(5) Also, as a result of the assurance from the Corps of the water level in Roberts Creek Lake rising only once every ten years, a local developer spent considerable money digging wells for a water system, building sewage lagoons for a sewer system, planting trees, and building streets for his development on the north and east side of Roberts Lake. Several people have bought lots and built houses in this development with the idea this would be their retirement home where they could have a boat tied to the shoreline which could be available to use whenever the desire struck for fishing or boating.

(6) Some of the residents have had their boats tied to shore for as long as 16 years with no interference or comments from the Corps. Beginning in 1986, the Corps will not permit boats to be left tied to shore overnight, except for those persons using the campgrounds -- and they can leave their boats in the water the entire period they are at the campgrounds.

1. Noted.

2. Noted.

3. We originally estimated that Robert's Creek Lake would flood once every 2.7 years. During the past 18 years, it has flooded 13 times. With the pool raise to elevation 734 feet NGVD, the frequency of flooding is projected to be once every 3 years.

   The estimates are based upon a 100-year period of analysis. The events which occurred during the first 18-years of at Lake Red Rock are not reflective of what will happen over the first 100-years of the reservoir's operation.

4. Noted.

5. Noted.

6. Regulations and policies prohibit the private use of public lands by adjacent landowners at Corps of Engineers projects.

7 Also, for 11 years, the ground area controlled by the Corps on the north side of the lake between the Park Hills Development and the water has been mowed by the developer, not only for a better appearance but to keep the population of rats, mice, snakes and other animals to a minimum so there would be the least undesirable effect on the homeowners. In 1986 this mowing was ordered stopped by the Corps, and the whole area has now grown up in weeds and the homeowners are beginning to see the effects of this lack of mowing.

8 Now the Corps has plans to raise the permanent level of the Red Rock Reservoir to 742 feet from the present 728 feet. Whether this is done in stages or all at once means serious problems for all persons concerned with Roberts Creek Lake. First of all, when the permanent level of 742 feet is reached, it will be only 8 feet below the level where it starts backing into Roberts Creek Lake inste f the 22 feet it is now. This can only mean one thing -- the water will back into R erts Creek Lake even more often than it does now and have further adverse effects on the efforts of the Conservation Board to have a good fishing lake, good beaches and a very good campground.

9 The fact that the Corps plans to increase the permanent level of Red Rock from 728 feet to 742 feet is sufficient evidence that Roberts Creek Lake is not needed as a sub-impoundment storage area for the Red Rock Reservoir. This, plus the fact that the Saylorville Reservoir took the pressure off Red Rock when it was completed.

10 The Marion County Conservation Board, the residents of Park Hills Development, plus hundreds of fishermen, boaters, campers, sunbathers and swimmers ask that Roberts Creek Lake be removed from the Red Rock Reservoir project and be turned over to the Marion County Conservation Board. It is further requested that the Corps install a solid steel gate on the spillway between the two bodies of water to prevent Red Rock from backing into Roberts Creek Lake in the future. This gate should be the type which can be opened and closed so that under normal conditions Roberts Creek Lake can empty into Red Rock Reservoir. (The original contractor who built the dam between the two bodies of water gives complete assurance that the dam is of sufficient strength to withstand the pressure of the water when Red Rock is filled and the gate is closed to keep Roberts Lake at its normal level. This assurance is also given by the Marion County Engineer.)

If this transfer of Roberts Creek Lake from the Corps to Marion County can be accomplished, the Marion County Conservation Board can then make this lake into one of Central Iowa's most popular family recreational lakes as it was originally intended.

For any clarification or additional information, please contact the following:

Mr. Phil Visser, President, Marion County Conservation Board (515-628-1040).

Mr. H. O. "Ho" Hansen, Poweshiek County Engineer (515-623-3446). Mr. Hansen was Marion County Engineer all the period when Red Rock Reservoir was built and is very well versed on all aspects.

Mr. J. D. Dibe, contractor who built the dam and developer of Park Hills (515-628-4051).

Mr. Glenn Ingle resident of Park Hills for 17½ years (515-627-5391) -- representing residents of Park Hills.

Mr. Mike Engstrom, resident of Park Hills for 8 years (515-627-5791) -- representing residents of Park Hills.

7. Except for those public areas developed for recreation sites, it is our objective to promote the growth of vegetation along the shoreline to enhance wildlife habitat, reduce erosion and preserve a natural appearance.

8. The flood frequency is projected to change from once every 2.7 years to once every 3.0 years.

9. Roberts Creek Lake provides about 18,000 acre-feet of flood water storage for Lake Red Rock. Raising the level of the conservation pool is required in order to accomodate sedimentation. Robert's Creek Lake has a flood water storage capability which is an integral part of the operating plan for Lake Red Rock.

10. The transfer of ownership of Roberts Creek Lake from the Corps of Engineers to Marion County and the installation of a steel gate would require specific Congressional authorization and funding.

U.S. Department of Housing and Urban Development
Kansas City Regional Office, Region VII
Professional Building
1103 Grand Avenue
Kansas City, Missouri 64106-2496

July 2, 1987

Neil Smart
Colonel, U. S. Army District Engineer
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Dear Colonel Smart:

SUBJECT: Draft Supplemental Environmental Impact Statement:
Lake Red Rock, Iowa, (June 1987)

This is to acknowledge that the subject draft supplemental environmental impact statement has been received by this office. It is being reviewed at the Omaha Field Office by the Environmental Officer, as follows:

Mr. Stan Quy
Environmental Officer
Department of Housing and
Urban Development
210 South 16th Street
Omaha, NE 68102-1622

Telephone: FTS 864-3835

1 Mr. Quy will review the statement and provide comments, if any, directly to you by August 14, 1987. If you do not receive a reply within this time frame you may assume we have no comments.

Sincerely,

Gary Ultican
Regional Environmental Officer
Office of Community Planning
and Development

cc:
Mr. Stan Cuy

1. Noted. No comments were received from the U.S. Department of Housing and Urban Development.

U.S. Department of Transportation
Federal Railroad Administration

400 Seventh St. S.W.
Washington, D.C. 20590

Room 1806
911 Walnut Street
Kansas City, Missouri 64106

July 2, 1987

Colonel Neil A. Smart
District Engineer
U. S. Army Engineer District
Rock Island
Attn: Planning Division
Clock Tower Building - P. O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

1 The draft Water Control Plan and Supplemental Environmental Impact Statement for the Lake Red Rock, Iowa, does not specifically identify the impact or necessary railroad changes with the raising of the conservation pool from its current level of 728 feet NGVD to 736 feet NGVD and eventually to the 742 feet NGVD level. The Water Control Plan should address this subject.

2 According to the distribution list, none of the railroads were sent copies of the proposed Lake Red Rock changes which may affect railroad location. Plate 4 identifies the relocation of the Chicago, Rock Island and Pacific Railroad, now the Chicago and North Western Transportation Company in the vicinity of Carlisle, Iowa, but details are not furnished.

3 Three railroads are located in the Lake Red Rock area and we recommend the railroads be furnished a copy of the plan. The railroads are:

Burlington Northern Railroad Company
Chicago and North Western Transportation Company
Norfolk and Southern Corporation

Sincerely,

H. T. Paton

H. T. Paton
Regional Director

1. All necessary relocations to railroads were completed prior to the construction of Lake Red Rock. This information will be added to the final Water Control Plan.

2. Plate 4 identifies a railroad relocation which has long since been accomplished. The plate has been updated to reflect the current conditions.

3. We have forwarded copies of the report to the railroads listed in the letter (see subsequent correspondence in this appendix).

KNOXVILLE CHAMBER OF COMMERCE

305 S. THIRD, P.O. BOX 337 KNOXVILLE, IOWA 50138 515-828-7555

July 3, 1987

U.S. Army Corps of Engineers
Rock Island District
Rock Island, Illinois

(1) We have studied the alternate plans in the Draft Water Control Plan, of Red Rock Lake and the resulting impact of each. As such, we favor the alternate as recommended in the Executive Summary. At the same time, we would, however, favor an accelerated time frame for the second step raise of 6 feet. We favor the two step plan for the following reasons:

*The maximum economic impact could be experienced.

*It would greatly enhance the aesthetic values of the lake.

*It would greatly increase the fish and wildlife habitat.

*It would increase the possibilities of new business ventures.

*It would probably enhance and insure the retrofit for power generation.

(2) We commenc the Corps for it's consideration, with the enactment of Public Law 99-190, as it pertains to the acquisition of flowage easement lands from WILLING sellers. We also commend the Corps for their efforts that will hopefully arrive at a plan that will be digestable by all parties concerned.

Sincerely,
Knoxville Chamber of Commerce
Board of Directors

Larry Johnson
President

nr

1. Noted.

2. Noted.

KNOXVILLE
INDUSTRIAL
DEVELOPMENT
CORPORATION

305 S. Third, P.O. Box 337, Knoxville, Iowa (515) 828-7555

July 3, 1987

U.S. Army Corps of Engineers
Rock Island District
Rock Island, Illinois

1 In careful consideration of the six plans outlined in the Water Control Plan draft, for Red Rock Lake, we strongly favor Plan 3. There are many benefits to this plan, but in our mind the two that are the most apparent are the improvement of the aesthetic values and the economic impact brought about by increased tourist visits to the area. It would also improve the possibility for more commercial enterprises. Although an immediate eight foot raise may inundate some wildlife areas, the potential for much greater wildlife areas is very apparent.

2 It is apparent that the second raise of six feet, in Plan 3, should be delayed in order to offer time for reconstruction of accesses and other facilities, but consideration should be given to shortening the time frame in which it is implemented.

3 At the same time, Public Law 99-190 should be implemented, but the key words in the acquisition of flowage easement lands is, willing sellers. However, the increased discharge rate at elevation 760 feet NGVD should have a bearing on their decision.

4 We commend the Corps of Engineers for their efforts in trying to arrive at a solution that would be the most compatable to all.

Sincerely,

Don Long

Don Long, President
Knoxville Industrial Development Corporation

rm

1. Noted.

2. Noted.

3. We are proceeding to execute the provisions of Public Law 99-190 and we have sent our first report to the Assistant Secreatry of the Army (Civil Works) for his approval.

4. Noted.

City of Knoxville, Iowa 50138-2287

305 S. Third • Telephone 515/842-3146 or 515/842-3147

July 7, 1987

Department of the Army
Rock Island District Corps of Engineers
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004
Attn: Neil A. Smart, Colonel

Dear Colonel Smart:

(1) Thank you for the recently submitted study regarding the raising of the Lake Red Rock pool. Since changes that are made to Lake Red Rock impact upon the City of Knoxville, the City Council considered your recommendation at its meeting of July 6, 1987. By a vote of 5 to 0 the Council voted to support your study's conclusion to raise the pool level to 742 feet by two stages.

It is the Council's belief that the benefits of the proposed changes outweigh the possible costs, not only for our immediate area but the State of Iowa as a whole. Primary costs appear to be that some land will be taken out of annual agricultural production and monetary cost incurred by the necessary changes to swimming and docking areas.

Benefits on the other hand appear to be primarily in the area of increased social and economic opportunities along with a reduction in environmental costs. Presently Iowa has a limited availability of publicly accessable water opportunities. The current development at the lake greatly enhances those opportunities, however, your proposal will improve that situation dramatically for the citizens of Iowa. This becomes more important with the increase in leisure time available to residents of Iowa.

As the recreational opportunities expand at the lake, greater private opportunities will develop in the general area as a spin off. With the depressed Iowa economy, this should provide a positive impact for the State.

Also, with increased recreational opportunities within a short driving distance of the majority of Iowa's population, energy saving should be realized. This will reduce the consumption of a finite resources and additional dollars can be used for other needs.

Thank you for your consideration of our position and if you have any questions, please contact either Mr. Richard Franc the City Manager, or myself.

Respectfully submitted,

Graham Fee
Mayor City of Knoxville

1. Noted.

TERRY E. BRANSTAD
GOVERNOR

OFFICE OF THE GOVERNOR

STATE CAPITOL
DES MOINES, IOWA 50319
515 281 5211

July 7, 1987

Colonel Neil A. Smart
Rock Island Corps of Engineers
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

Dear Colonel Smart:

I have attached the State of Iowa position statement on the June 1987 Draft Water Control Plan for Lake Red Rock. This statement will be presented by Iowa Department of Natural Resources Director Larry Wilson at your public meeting in Pella on July 7, 1987.

1 The primary comment in the statement is support of a two-step raise from 728 to 736 and then to 742. Rather than waiting 10 years to reevaluate the need and desire to raise the pool from 736 to 742, we recommend redesign and relocation of desired recreation facilities, roads and bridges as soon as possible. The pool can immediately thereafter be raised to 742. This work and pool raise should be completed within 2 years from now.

Thank you for the opportunity to review the draft plan and provide comments.

Very truly yours,

Terry E. Branstad

Terry E. Branstad
Governor, State of Iowa

Attachment

1. Noted. Comments are addressed on the following pages.

Iowa Department of Natural Resources Statement
on the June 1987 Draft Water Control Plan for Lake Red Rock
Presented by Director Larry J. Wilson at the July 7, 1987 Public Hearing

On behalf of the Iowa Department of Natural Resources, I present the following comments for the Corps of Engineers' consideration on the June 1987 Draft Water Control Plan for Lake Red Rock:

(1) 1. We recommend the level of the Lake Red Rock pool be raised to 742 feet as soon as practical, which could be within 2 years from now. The pool can be raised immediately to 736 so that benefits from a higher level can soon be realized. This can be done at little or no expense. During this interim 2-year period, recreation facilities, roads, and bridges that would be unserviceable at 742 can be evaluated in regards to their necessity and the benefits of redesigning or relocating them. Facilities planned for relocation or reconstruction can then be made fully serviceable at a lake level of 742 for the 1990 recreation season. All costs of evaluating, redesigning, and reconstructing facilities shall be incurred by the federal government. County and state agencies should not be expected to incur any expenses for this work.

(2) 2. Raising the conservation pool of Red Rock to 742 will permanently inundate an additional 10,000 acres of land, much of which is currently licensed to the Iowa DNR for wildlife management. Of course, that land which becomes permanently inundated will become part of the sovereign bed of the river and a license on such land will no longer be necessary. This inundation will only be acceptable if the Corps acquires the easement land in fee title and includes that which is above 742 in the fish and wildlife license to the DNR. This will be consistent with Congressman Smith's intent when he successfully secured a Congressional appropriation to the Corps for purchasing Red Rock easement lands. The Condition 5 funds derived from cropping such lands can then be used for fish and wildlife management , such as building dikes and control structures to increase management capabilities.

1. Noted.

2. It is our position that lands acquired by the Federal government will remain in fee simple title to the United States. We are proceeding with the acquisition of easement lands from willing sellers in accordance with Public Law 99-190, although this action is separate from the pool raise. Management responsibility for easement lands which may be acquired in the future will be determined at an appropriate time.

3 3. The Iowa DNR also recommends that a flexible Fall pool raise for waterfowl management be included in the plan. A 2-foot Fall pool raise has been implemented in recent years and we appreciate the Corps' cooperation. Our observations show that significantly more waterfowl benefits can be achieved by tailoring the Fall raise between 0 and 6 feet to each year's particular water level and vegetation conditions. The Iowa DNR Director will provide an annual Fall pool raise recommendation to the Corps in late August of each year. These recommendations may include one or more raises during the Fall. Such phasing of water level raises will in some years be very beneficial for waterfowl management.

4 4. I also want to reaffirm the State of Iowa position that the Corps of Engineers continue to maintain, at minimum, 50,000 acre feet of conservation storage in Lake Red Rock for the purpose of low-flow augmentation. This 50,000 along with the 75,000 acre feet of minimum storage at Saylorville Lake will help maintain a high degree of reliability in providing minimum flows of 300 cubic feet per second in the Des Moines River below Red Rock Dam. This amount of minimum storage will guarantee better sanitary conditions, more constant water supply for industrial and urban use, and better environmental conditions for fish, wildlife, and recreation.

5 5. The recommended improved regulation on release rates entails lengthening the period during which outflow will not exceed 30,000 cfs by 10 days and increasing the maximum outflow from 18,000 to 22,000 cfs when pool elevation is above 760 during the growing season. This improvement will likely benefit agricultural uses around the lake while having minimal adverse impacts downstream of the dam.

Thank you for giving me the opportunity to review the draft plan and provide these comments.

Larry J. Wilson
July 7, 1987

3. Our recommendation will formalize the 2-foot fall pool raise. Following approval of the plan, we will initiate a separate study to examine the feasibility of seasonal pool variations for fish and wildlife purposes. The new study will be address the concerns and will be fully coordinated with the State of Iowa and conservation agencies and organizations.

4. Noted.

5. Noted.

STATEMENT

ON THE JUNE, 1987

DRAFT WATER CONTROL PLAN FOR LAKE RED ROCK

DALE M. COCHRAN, SECRETARY OF AGRICULTURE

IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

Thank you for the opportunity to present comments of the Iowa Department of Agriculture and Land Stewardship with respect to the June, 1987 Draft Water Control Plan for Lake Red Rock, as developed by the US Army Corps of Engineers, Rock Island District.

Since its completion in 1969, the Corps of Engineers has managed Lake Red Rock for flood control, recreation, fish and wildlife habitat, and low-flow augmentation for the Des Moines River, downstream from the Lake. Sediment deposition within the lake has reduced the reservoir's ability to meet the design objectives. In response to this accelerated sedimentation, the Corps proposes in the June 1987 draft to raise the Lake Red Rock pool to elevation 742 feet NGVD. The reason for this action as proposed by the Corps is to ensure that the reservoir will continue

to meet the design purposes. In anticipation of this action by the Corps the following comments identify several issues that must become a part of the implementation process.

1 1. All costs incurred in the development and implementation of this change must be paid by the federal government, including the redesign and reconstruction of facilities for lake access and use.

2 2. Landowners affected by raising the conservation pool to 742 feet must be compensated by the federal government through land purchase or easement purchase. Frequency of flooding on easement lands should be reassessed for the 742 foot conservation pool level, to ensure that landowners are properly compensated.

3 3. The US Army Corps of Engineers should conduct a study to determine desirable and feasible actions which will reduce the rate of sedimentation of the reservoir. These studies should evaluate and quantify all sediment sources and tributary stream contributing to the sediment loading of the reservoir. Critical areas of sediment production and alternate measures which could be used to reduce the volume of sediment entering the reservoir should be identified. The evaluation of alternative sediment control measures should identify (1) measures by which sediment

1. Noted.

2. Affected landowners have already been paid by the government for the right to occasionally overflow where we hold easements. Impacts to easement lands with an elevation 734 feet NGVD conservation pool are not significant enough to warrant an acquisition of greater interest in the land. The Corps of Engineers is preparing to acquire fee title to easement lands from willing sellers under a separate authority.

3. We have evaluated sediment sources in a report entitled "Sediment Studies Above Lake Red Rock" prepared by Iowa State University in June 1985. We currently are not funded to study methods for reducing sedimentation at Lake Red Rock. Agencies such as the Soil Conservation Service may be more able to examine these problems.

production from critical areas could be reduced, and (2) measures by which sediment delivery from tributary streams might be prevented from reaching the reservoir. The study should also evaluate the technical, environmental and economic feasibility of each alternate control measure.

4 Sedimentation rates to date have greatly exceeded those predicted when the original management plan for Lake Red Rock
5 was developed. The need to raise the conservation pool has
6 occurred much earlier than originally predicted. Reducing sediment delivery to the reservoir is likely to be the most cost effective way to assure that Lake Red Rock meets its management goals throughout its projected 100 year life. The benefits from the reduction in sediment delivery will, in addition to extending the life of the reservoir, reduce the delivery of chemical pollutants attached to the sediment.

The US Army Corps of Engineers has an obligation to enhance the quality of life for present and future generations in Iowa by (1) assuring the long term effectiveness of Lake Red Rock; (2) assisting to preserve the land resource base; and (3) providing the most effective use of tax dollars. An evaluation of appropriate methods for reducing sediment delivery to the reservoir and implementation of the feasible alternatives must be a part of the management plan for Lake Red Rock.

4. We originally predicted that sedimentation would occur at a rate of 4,000 acre-feet per year. Thus far, sedimentation has occured at a rate of about 5,000 acre-feet per year.

5. The need to raise the conservation pool has occured due to the high sedimentation rate.

6. Our studies indicate that raising the conservation pool is the most cost effective method of dealing with sedimentation at the lake.

STATEMENT OF THE
IOWA ASSOCIATION OF SOIL AND WATER CONSERVATION DISTRICT COMMISSIONERS
ON THE
JUNE 1987 DRAFT WATER CONTROL PLAN FOR LAKE RED ROCK

Thank you for allowing me to present comments on behalf of the Iowa Association of Soil and Water Conservation District Commissioners concerning the June 1987 Draft Water Control Plan for Lake Red Rock.

(1) For many years, soil and water conservation districts have stressed the need for proper conservation treatment on the lands of Iowa. The soil erosion problem in Iowa is severe. It is the sediment produced from our productive, yet erosive soils which have impaired Lake Red Rock. Soil erosion is a public problem which needs to be addressed by the Federal sector.

(2) We believe the proposal by the U.S. Army Corps of Engineers to raise Lake Red Rock is incomplete. It is not an appropriate use of public funds to continually raise the lake level to accommodate the accumulating sediment, without addressing the source of the problems addressed in the draft water control plan.

(3) The Association strongly supports Federal funding to develop, plan, and install watershed and land treatment measures to reduce the amount of sediment delivered to Lake Red Rock as part of the proposal presented by the Corps of Engineers.

(4) With proper land treatment, the life of the lake can be extended. This would result in improved fish and wildlife habitat, and a lessening of the need for and impact of flooding additional land areas for the storing of sediment.

We believe the U.S. Army Corps of Engineers must address the total problem of reducing sediment delivery while accommodating the purposes of the lake.

Respectfully submitted,

Glenn Burrows

Glenn Burrows, President
Iowa Association of Soil and Water
Conservation District Commissioners

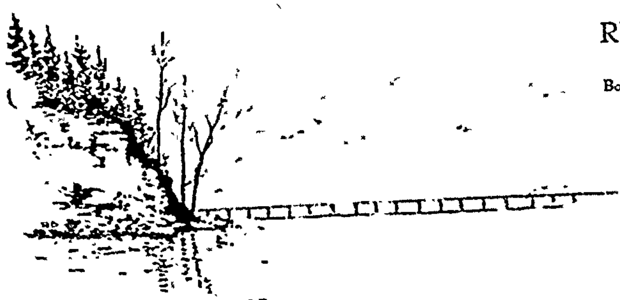
July 7, 1987

1. Noted.

2. Our studies indicate that raising the conservation pool is the most cost-efficient way to accomodate sedimentation at Lake Red Rock.

3. We do not have the authority or funding for upland treatment on non-Federal lands.

4. Noted.



RED ROCK LAKE ASSN.

Box 145 Pella, Iowa 50219

July 7, 1987

To: U.S. Army Engineer District Rock Island
Att: CENCR-PD-P
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

1 The Red Rock Lake Association has promoted increasing the lake level since the mud flats developed in the late '70's. While the 3 foot level increase helped, it was only a short term fix.

3 As an association of families and businesses with interests on and around the lake, we would like to go on record as favoring the following:

1. An immediate 8 foot level increase to 736. We need water in the lake in the summer of 1987.
2. Complete improvements required to raise the lake level to 742 and raise the level to 742 as soon as possible.
3. Work out fair and equitable arrangement with land owners.

We feel all three steps should be carried forth with a "sense of urgency".

Best Regards,

B. Hagemeyer

Bruce Hagemeyer
Red Rock Lake Association

1. Noted.

2. Noted.

A VOLUNTARY ASSOCIATION OF BUSINESSES AND INDIVIDUALS TO AID DEVELOPMENT OF THE RED ROCK AREA FOR WILDLIFE, FLOOD CONTROL, CAMPING, & WATER SPORTS.

GALVIN REALTY

216 SOUTH SECOND STREET   OFFICE PHONE 842-2910

KNOXVILLE, IOWA 50138

July 10, 1987

U.S. Army Engineer District Rock Island
Attention CENCR-PO-P
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: RED ROCK LAKE

(1) After seeing the presentation of the various charts and graphs; also, the recommendations of the Iowa Natural Resources, I have changed my mind to support Plan 1, or raising the lake level to 742 feet as soon as practical.

(2) As I understand it, the Corps has the right to raise it to this level because it will not go above any of the easement land.

(3) In my opinion, it would be easier to negotiate and would remove some doubt in the easement owners' minds as to the effect of this 742 ft. level.

(4) I remember that this 5' easement area caused more dissatisfaction in the early negotiations, and it will be more so now.

(5) I would recommend that the Corps purchase all land that would have a five year flowage easement, even under the 742' level. By this, I mean doing away with this area of easement, and possibly start it in a 10 year level for easement purposes.

(6) This area, around Red Rock Lake proper and the nearby tributaries, is in an especially depressed economic situation in regard to land values. It is going to be difficult, within the next two to three years, to put a fair market value on the land.

(7) When the taking was first negotiated, land values were rather stable, but that is not the situation now, and it will be very difficult for appraisers and negotiators.

REALTOR®

C. R. Galvin

C. R. Galvin

MASTER SENIOR APPRAISER

CRG:mbvn

1. Noted.

2. We have the authority to raise the conservation pool to accomodate sedimentation. We do not have the authority to raise the conservation pool above any easement lands since the Federal government only purchased the right to occasionally overflow those lands.

3. Noted.

4. Noted.

5. We own all lands below elevation 760 feet NGVD in fee simple title. Specific Congressional authorization would be required for the acquisition of all lands anticipated to be flooded every 10 years. Note that the authority does exist for the acquisition of easement lands from willing sellers in accordance with Public Law 99-190.

6. Fair market value is the present market value, and is estimated by observing and studying what is currently happening in the local real estate market.

7. Noted.

Mater Clinic
PROFESSIONAL CORPORATION

E. J. McKeever, M.D.
J. E. Griffin, M.D., F.A.C.S.*
C. D. Vander Linden, M.D.
R. D. Des Campo, D.O.
B. C. Hillyer, M.D.
A. L. Knight, M.D.**
T. E. Brown, M.D.
T. A. Van Gundy, M.D.***

*Diplomate of American Board of Surgery
**Diplomate of American Board of Internal Medicine
***Diplomate of American Board of Ophthalmology

July 10, 1987

U. S. Army Engineer District
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61204-2004

Gentlemen:

We were very impressed with the depth of your study and the brilliant presentation you made to the public concerning the Red Rock Dam, at Central College in Pella, Iowa last Tuesday evening.

1 We are residents of the Red Rock Lake area, and are in total agreement with your proposed plans for elevating the lake levels. We really prefer the Governor's plan to elevate the lake in a shorter, rather than a longer period of time.

Sincerely,

Donna M Speece

Donna M. Speece
Administrator

DMS:mg

1202 WEST HOWARD ST. / KNOXVILLE, IOWA 50138 / (515) 828-7211

1. Noted.

CONTEL

Continental Telephone of Iowa
1714 West Jackson
Knoxville IA 50138
515 828 8400

July 13, 1987

U.S. Army Corps of Engineers, Planning Division
Clocktown Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

I would like to express my thoughts on the situation that exists concerning raising the water level at Lake Red Rock.

(1) I am in favor of Plan 3, as I feel this plan will satisfy the majority of persons affected by the decision to raise the water level of the lake.

(2) I would like to see a time limit of two to three years set for the sediment study to be completed and the final raise in water level to 742 feet completed with a four year period.

(3) I would hope that the sediment study would address ways to control the amount of sediment that is being deposited as a result of flood control. Perhaps enforcing strict soil conservation measures within the lakes' area up to the 780 foot level would be a way to (4) control the sediment problem. I feel the practice of leasing land for farming purposes should be discontinued as the majority of the sediment problem originates from land being farmed within the flood plain for the lake.

(5) I also wonder how much of the sediment problem can be attributed to the debris that is deposited between the mile long bridge and the dam whenever the lake level is raised as a result of flood control. Perhaps a more agressive clean-up program of the shore area would also be a way to control the sediment problem.

(6) Another area that I am concerned about is the amount of polution that is being caused by the run off of ag chemicals. I feel this problem will be detrimental to any future recreational plans for the lake.

I know that in the public meetings most of the conversation is dominated by groups of people that are against any changes in the operation of the lake.

(7) My personal feelings are that the benefits that would be derived from improved recreational and wild life conservation practices would greatly outweigh the benefits to a selected few individuals by continuing the present management practice.

Thank you for providing Marion County with some of the best camping areas in the Midwest.

Sincerely,

Don H Long

Don H. Long

WPADL693/18

1. Noted.

2. Subsequent raise(s) will be done in accordance with an agreement yet to be established with the State of Iowa.

3. We do not have the authority to enforce soil conservation measures on lands upon which we only hold a flowage easement (elevation 760 feet NGVD to 783 feet NGVD). Below elevation 760 feet NGVD, most of the lands are managed by the Iowa Department of Natural Resources and the Corps of Engineers. However, the pool represents less than 1.5-percent of the area contributing runoff and sediment. Most of the sediment comes from land above elevation 780 feet NGVD.

4. See the response to No. 3 above. Most of the lands under cultivation at Lake Red Rock are leased to the Iowa Department of Natural Resources which, in turn, leases areas for farming. Crops are grown for fish and wildlife management purposes.

5. Debris in the lake does not significantly contribute to sedimentation.

6. The amount of agricultural-related runoff to Lake Red Rock is typical for primarily agricultual basins. It is difficult to control because it originates from many diffuse sources. However, any impact on Lake Red Rock will not be dependant upon the lake level.

7. Noted.

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

July 16, 1987

Col. Neil A. Smart. District Engineer
Rock Island District
C.O.E.
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

Dear Col. Smart:

1 This is in reply to the comments made at the Red Rock meeting by a Marion County supervisor about the raw sewage bypasses in Des Moines.

There are a total of 35 known potential bypass locations in the Des Moines sewer system. Most only discharge during extreme wet weather conditions or during equipment breakdown. Extreme is much more than the one inch of rain the person stated. Major points of discharge are monitored by the city with the most frequent bypass located at the main treatment plant.

During the period of January 1986 through January 1987 bypasses occurred at the treatment plant on 51 days. The average bypass flow on those days was 5.5 million gallons per day (mgd). During that same period, flow in the Des Moines River ranged from 1,190 to 21,800 cubic feet per second (cfs). Since these flows are considerably greater than the 7-day, 10-year low flow value (270 cfs) used to establish the Des Moines permit effluent limits, sufficient capacity existed in the Des Moines River during that period to assimilate the waste without significantly affecting water quality. The average biochemical oxygen demand (BOD) concentration in the river increased 0.8 mg/l from a point upstream of the discharge to a point downstream of the discharge. The average ammonia increased 0.126 mg/l. Although the Des Moines wastewater discharges did not appreciably impact water quality in the river during that time, significant water quality impact would be expected during low river flow conditions.

To eliminate the potential for an adverse impact to the river during low river flow, the cities in the Des Moines metro area are in the middle of a $200,000,000 wastewater treatment facility improvement project. The treatment plant is being expanded to handle all the waste flow coming to it which will eliminate a major bypass. Also, storm water equalization basins are being constructed out in the sewage collection system to store high sewage flows during wet weather, rather than bypass, and then drain back into the sewer when the high flows subside. Once the total project is completed in about 1993, bypassing will be eliminated except for very extreme and unusual conditions.

Hopefully, this addresses the concerns expressed at the meeting. If there are still questions or concerns, please contact me.

Sincerely,

LARRY J. WILSON, DIRECTOR
DEPARTMENT OF NATURAL RESOURCES

LJW/mjt

1. Noted.

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF ECONOMIC DEVELOPMENT
ALLAN T. THOMS, DIRECTOR

July 20, 1987

Colonel Neil A. Smart, District Engineer
U.S. Army Corp of Engineers
Rock Island District
P.O. Box 2004
Rock Island, Illinois 61204-2004

Attn: Planning Division

Re: IA880702-013

Dear Colonel Smart:

1 The Iowa State Clearinghouse has performed the required review of the Draft Water Control Plan with the Draft Supplemental Environmental Impact Statement for Lake Red Rock, Iowa in accordance with the Iowa Intergovernmental Review System.

The review:

-- did not generate any comment from those who examined the file.

-- found no serious environmental problems which may result from the project or program.

-- indicated that the proposal conforms to pertinent planning in this area.

-- did not show that the proposal would result in duplicating any existing activity or project.

2 The Clearinghouse is pleased to recommend that the application be approved for funding. A copy of this letter must be sent to the federal agency as evidence that the review has been performed.

Sincerely,

A. Thomas Wallace

A. Thomas Wallace
Federal Funds Coordinator

ATW/ml

200 EAST GRAND / DES MOINES, IOWA 50309 / 515 281-3251 / TELEX 478 466

1. Noted.

2. Noted.

NEAL SMITH
MEMBER OF CONGRESS
FOURTH DISTRICT IOWA

WASHINGTON OFFICE
2373 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
PHONE (202) 225-4426

DISTRICT OFFICES
544 INSURANCE EXCHANGE BUILDING
DES MOINES, IA 50309
PHONE (515) 284-4634

P.O. BOX 1748
218 POST OFFICE BUILDING
AMES, IA 50010
PHONE (515) 232-5221

Congress of the United States
House of Representatives
Washington, DC 20515

CHAIRMAN
APPROPRIATIONS SUBCOMMITTEE FOR:
DEPARTMENT OF COMMERCE
DEPARTMENT OF JUSTICE
DEPARTMENT OF STATE
FEDERAL JUDICIARY
SMALL BUSINESS ADMINISTRATION
FEDERAL TRADE COMMISSION
FBI
SEC
FCC
INTERNATIONAL TRADE COMMISSION
U.S. TRADE REPRESENTATIVE
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DEPARTMENT OF HEALTH AND HUMAN SERVICES
DEPARTMENT OF LABOR
NLRB
R.R. RETIREMENT BOARD
NATIONAL INSTITUTES OF HEALTH
SOCIAL SECURITY
PUBLIC HEALTH SERVICE
MISCELLANEOUS RELATED AGENCIES
MEMBER
COMMITTEE ON SMALL BUSINESS

July 20, 1987

Colonel Neil Smart
District Engineer
U.S. Army Corps of Engineers
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

I understand that the extensive study made to determine the level of the permanent pool at Red Rock has been completed. It was always known that the level would be raised but the timing and level have been in doubt. The study indicates that it is no longer a question of whether it should be raised now but rather how much it should be raised and whether it should be in one step or two and that the preliminary recommendation is to raise it to 742 feet in two steps.

I understand that technology acquired since the construction of the Dam and adjustments in operating procedures would permit the project to be operated with substantially the same flood protection downstream which was available at the time of construction. Even at the 742 level, less than 15% of the capacity would be devoted to the permanent pool and then only when not needed in preparation for a possible flood. This multipurpose project needs an adequate permanent pool to assure water quality and minimum flow (which are needed for industries and utilities at Ottumwa and Eddyville), recreation opportunities, environmental enhancement including increasing fish and wildlife habitat, and to result in the silting accumulating further upstream. Any owner of land above the level of the fee land but in the maximum pool area who believes the risk of flooding would be increased has a right under a recently passed bill to sell their remaining rights which are subject to easement. On the other hand, temporarily stopping at the 736 level means that silting will be downstream further than it otherwise would be and cause those concerned to adjust twice instead of once.

1 I agree with almost everyone who has corresponded with me, including both private and public groups, that it would be much better to raise the pool to the 742 foot level in one stage; however, I am not opposed to the recommendations made by the Governor and the Iowa Department of Natural Resources to delay part of the increase for a maximum of two years to facilitate preparation for the 742 level.

Sincerely,

Neal Smith

Neal Smith
Member of Congress

1. Noted.

City of Knoxville, Iowa 50138-2287

05 S. Third • Telephone 515/842-3146 or 515/842-3147

August 3, 1987

Robert Clevenstine
District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Clevenstine:

1 I want to indicate my support to your office for the raising of the pool level of Lake Red Rock to 742 feet.

2 I believe the increase in the lake level would have to be beneficial to the State of Iowa by providing an improved water recreation area. As you are aware, Iowa has limited water resources available for its citizens. Further, I believe it would encourage economic development in the immediate area. It is also likely that energy would be saved by the lakes improvement since people in Iowa would have an additional improved recreational facility close by.

3 My family has visited Lake Red Rock on a number of occasions and I want to express my appreciation to the Corps of Engineers on such fine facilities. We have enjoyed the Visitor Center and the numerous camp grounds. The raising of the lake level can only enhance the area.

Thank you for your consideration.

Respectfully submitted,

Richard D. Franc
City Manager

RDF/cg

1. Noted.

2. Noted.

3. Noted.

Advisory
Council On
Historic
Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

AUG - 7 1987

Mr. Dudley M. Hanson, P.E.
Chief, Planning Division
Rock Island District
U.S. Army Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

REF: Pool Raise Project, FY 87 Activities, Lake Red Rock
Marion, Jasper, Warren, and Polk Counties, Iowa

Dear Mr. Hanson:

We have received and reviewed information relative to the referenced proposal. As you know, the Corps originally proposed considering the impacts of the raising of the lake level from 730 feet NGVD to 742-44 feet NGVD as part of a Programmatic Agreement for future Corps management of Lake Red Rock. However, in the interim, only four of the sites identified and evaluated to date merit data recovery (13MA209, 13MA262, 13MA387, and 13MA400).

1 We understand that time is of the essence in the letting of contracts for this work during FY 87, and it is the Iowa SHPO's opinion that the referenced project would not adversely affect those properties eligible for inclusion in the National Register of Historic Places based on implementation of a data recovery plan. Therefore, based on our review of the Scope of Work for completion of data recovery at these four sites, the Corps' commitment to continue to consult with the Iowa SHPO during that effort, and the agreement of all parties to complete development of a Programmatic Agreement covering future Corps actions and management at Lake Red Rock, we have no objection to the Corps proceeding with data recovery activities under a determination of no adverse effect.

2 This letter evidences that the requirements of Section 106 of the National Historic Preservation Act and the Council's regulations have been met for the initial phases of this project. We will be contacting your staff to discuss completion of the proposed Programmatic Agreement in the near future. Both this letter and your supporting documentation should be retained in your environmental or project files.

Thank you for your continued cooperation. If you or your staff have further questions or concerns, please continue to contact Staff Archeologist Ronald D. Anzalone at 202-786-0505 (an FTS number).

Sincerely,

for Don L. Klima
Chief, Eastern Division
of Project Review

1. Execution of the data recovery plan was initiated in September 1987 for three of the four sites in accordance with the programmatic agreement.

2. Noted.

Iowa
State Historical Department

East 12th and Grand Avenue, Des Moines, Iowa 50
(515) 281-5111

August 7, 1987

Dudley M. Hanson, P.E.
Chief, Planning Division
U.S. District Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

RE: ARCHAEOLOGICAL SITE TESTING, LAKE RED ROCK, IOWA: POOL RAISE PROJECT, 1986 SEASON (DACW25-86-C-0059).

Dear Mr. Hanson:

We have completed our review of the above referenced project based on the report of Phase II investigations conducted by the American Resources Group. Sites 13MA262 and 13MA387 have been previously evaluated and considered eligible for listing on the National Register of Historic Places (our letter of April 14, 1987). Based on the additional investigations conducted by ARG, in our opinion, sites 13MA209 and 13MA400 are also eligible for the National Register of Historic Places. Site 13MA209 is an extensive Oneota village with evidence of intact house structures. It is likely to yield data significant to our understanding of the Moingona phase Oneota occupation of the central Des Moines River valley. The nineteenth century historic archeological site of 13MA400 contains the intact remains of at least one structure. This site has the potential to provide significant data concerning rural stoneware distribution and habitation patterns. If you concur with our opinion, 13MA209 and 13MA400 will be considered eligible for Section 106 purposes. Should you disagree with our opinion, you should seek a Determination of Eligibility from the Keeper of the National Register.

Because these two archeological sites are considered eligible for the National Register and the COE proposed annual 2 ft fall raise and continued flood pool raises will promote the processes of erosion and redeposition impacting the sites, the project must be reviewed in accordance with the requirements of 36 CFR Part 800.9(c). The pool raise will clearly have an adverse effect on sites 13MA209, 262, 387, and 400. However, when a historic property is of value for its potential contribution to archeological research and the value can be preserved through the conduct of an appropriate data recovery program, the effect of the undertaking shall be considered as being not adverse.

1 Therefore, if you agree to provide us with final plans and specifications for the pool raise prior to construction and a proposed data recovery plan for the four sites, we would concur with a finding of conditional no adverse effect as defined in 36 CFR Part 800.9.

You should include a copy of this letter with your documented finding to the Advisory Council on Historic Preservation as specified in 36 CFR 800.6 and described in 800.8(a).

This project has been reviewed by our staff archeologist, Dr. Kay Simpson. Questions or comments may be directed to her at 515/281-8744.

Sincerely,

David Crosson, Administrator
State Historic Preservation Officer

cc: Ron Anzalone, ACHP

1. We are proceeding with data recovery activities for sites 13 MA 209, 262, 387 and 400, and we will coordinate with the Iowa State Historical Department prior to raising the conservation pool.

Wapello County Soil Conservation District

700 FARM CREDIT DRIVE
Telephone: 682-0752
Ottumwa, Iowa
52501

August 10, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear District Engineer:

This letter is in response to the Draft Water Control Plan for Lake Red Rock as presented at the public meeting at Pella on July 7, 1987.

1 We are concerned that raising the conservation pool from 728 feet to 742 feet will result in considerable loss of temporary storage for downstream flood protection. To maintain the maximum potential flood protection for the longest period of time, we feel that the conservation pool be raised only as needed to compensate for sedimentation until the elevation of 742 feet is reached. This plan appears to be what you have identified as Plan 1.

2 Since most of the sediment coming into Lake Red Rock is a product of cropland erosion, application of soil conservation practices within the watershed would seem to be a worthwhile alternative to study. The 1985 Food Security Act requires that a conservation plan be developed for all highly erodible land by 1990 and that that plan be applied to the land by 1995 in order to maintain eligibility for most Federal Farm Programs. It is anticipated that most farms will participate in this program. We propose that this reduced rate of future sedimentation be considered. Conceivably, this may permit the future conservation pool to be something less than 742 feet.

3 In all proposed plans, the release rates would be increased and the time periods extended. We feel that this will intensify an already serious streambank erosion problem. We request that these increased flows be evaluated with regard to increased stream bank erosion. Where stream bank erosion is a problem, or where it is anticipated to be a problem, we request that appropriate measures be taken to provide the necessary erosion control.

Sincerely,

Ed Klodt
by R.B.
Ed Klodt, Chairman
Wapello County Soil & Water Conservation District

1. Noted. A conservation pool raise to elevation 734 feet NGVD will result in about a 4-percent reduction in flood control storage.

2. The Corps of Engineers periodically surveys the actual amount of sediment deposited in Lake Red Rock, and this information, along with other factors, is considered in formulating pool raise alternatives and estimating sedimentation rates.

3. We have studied streambank erosion below the Red Rock dam. The Des Moines River is a dynamic system and we are not able to measure any difference in erosion rates.

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW

August 11, 1987

ER 87/849

Colonel William C. Burns
District Engineer
U.S. Army Corps of Engineers
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61201-2004

Dear Colonel Burns:

This is in regard to your letter requesting the Department of the Interior's review and comments on the Draft Supplemental Environmental Statement and Report for Water Control Plan, Lake Red Rock, Marion County, Iowa.

1 This is to inform you that the Department will have comments on the subject document but will be unable to reply by the date you requested. Our comments should be available by August 26, 1987.

Sincerely,

Sheila M. Huff
Sheila M. Huff
Regional Environmental Officer

1. Noted. The U.S. Department of the Interior, Office of Environmental Project Review, submitted comments in a letter dated August 25, 1987 (located elsewhere in this appendix).

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

LARRY J. WILSON, DIRECTOR

August 11, 1987

Colonel Neil Smart
Rock Island Corps of Engineers
Clock Tower Building
P. O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

1 The Des Moines Recreation River and Greenbelt steering committee, on behalf of the full Advisory Committee endorses the state of Iowa's statement on the June, 1987 Draft Water Control Plan for Lake Red Rock. This statement is attached and it is the same one I presented at your July 7, 1987, public hearing.

1. Noted. See the Iowa Department of Natural Resources' original letter, dated July 7, 1987, for responses to comments (located elsewhere in this appendix).

Sincerely,

LARRY J. WILSON
CHAIRMAN, DES MOINES RECREATION RIVER
AND GREENBELT ADVISORY COMMITTEE;
AND DIRECTOR, IOWA DEPARTMENT OF NATURAL RESOURCES

L58.rlt

Attachment

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145

Iowa Department of Natural Resources Statement

on the June 1987 Draft Water Control Plan for Lake Red Rock

Presented by Director Larry J. Wilson at the July 7, 1987 Public Hearing

On behalf of the Iowa Department of Natural Resources, I present the following comments for the Corps of Engineers' consideration on the June 1987 Draft Water Control Plan for Lake Red Rock:

1. We recommend the level of the Lake Red Rock pool be raised to 742 feet as soon as practical, which could be within 2 years from now. The pool can be raised immediately to 736 so that benefits from a higher level can soon be realized. This can be done at little or no expense. During this interim 2-year period, recreation facilities, roads, and bridges that would be unserviceable at 742 can be evaluated in regards to their necessity and the benefits of redesigning or relocating them. Facilities planned for relocation or reconstruction can then be made fully serviceable at a lake level of 742 for the 1990 recreation season. All costs of evaluating, redesigning, and reconstructing facilities shall be incurred by the federal government. County and state agencies should not be expected to incur any expenses for this work.

2. Raising the conservation pool of Red Rock to 742 will permanently inundate an additional 10,000 acres of land, much of which is currently licensed to the Iowa DNR for wildlife management. Of course, that land which becomes permanently inundated will become part of the sovereign bed of the river and a license on such land will no longer be necessary. This inundation will only be acceptable if the Corps acquires the easement land in fee title and includes that which is above 742 in the fish and wildlife license to the DNR. This will be consistent with Congressman Smith's intent when he successfully secured a Congressional appropriation to the Corps for purchasing Red Rock easement lands. The Condition 5 funds derived from cropping such lands can then be used for fish and wildlife management , such as building dikes and control structures to increase management capabilities.

3. The Iowa DNR also recommends that a flexible Fall pool raise for waterfowl management be included in the plan. A 2-foot Fall pool raise has been implemented in recent years and we appreciate the Corps' cooperation. Our observations show that significantly more waterfowl benefits can be achievzd by tailoring the Fall raise between 0 and 6 feet to each year's particular water level and vegetation conditions. The Iowa DNR Director will provide an annual Fall pool raise recommendation to the Corps in late August of each year. These recommendations may include one or more raises during the Fall. Such phasing of water level raises will in some years be very beneficial for waterfowl management.

4. I also want to reaffirm the State of Iowa position that the Corps of Engineers continue to maintain, at minimum, 50,000 acre feet of conservation storage in Lake Red Rock for the purpose of low-flow augmentation. This 50,000 along with the 75,000 acre feet of minimum storage at Saylorville Lake will help maintain a high degree of reliability in providing minimum flows of 300 cubic feet per second in the Des Moines River below Red Rock Dam. This amount of minimum storage will guarantee better sanitary conditions, more constant water supply for industrial and urban use, and better environmental conditions for fish, wildlife, and recreation.

5. The recommended improved regulation on release rates entails lengthening the period during which outflow will not exceed 30,000 cfs by 10 days and increasing the maximum outflow from 18,000 to 22,000 cfs when pool elevation is above 760 during the growing season. This improvement will likely benefit agricultural uses around the lake while having minimal adverse impacts downstream of the dam.

Thank you for giving me the opportunity to review the draft plan and provide these comments.

Ottumwa In Motion

OTTUMWA

Ottumwa Area Chamber of Commerce
106 North Court Mall • P.O. Box 308 • Ottumwa, Iowa 52501
Phone 515 682-3465

August 11, 1987

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

The Ag Committee, of the Ottumwa Chamber of Commerce, has the following comments to the Draft Water Control Plan for Lake Red Rock as presented at the public meeting at Pella on July 7, 1987:

1 Raising the conservation pool from 728 feet to 742 feet will result in considerable loss of temporary storage for downstream flood protection. To maintain the maximum potential flood protection for the longest period of time, we feel that the conservation pool should be raised only as needed to compensate for sedimentation until the elevation of 742 feet is reached. This plan appears to be what you have identified as Plan 1.

2 Since most of the sediment coming into Lake Red Rock is a product of cropland erosion, application of soil conservation practices within the wtershed would seem to be a worthwhile goal. The 1985 Food Security Act requires that a conservation plan be developed for all highly erodible land by 1990 and that that plan be applied to the land by 1995 in order to maintain eligibility for most Federal Farm Programs. It is anticipated that 3 most farms will participate in this program. A reduced rate of 4 sedimentation, in addition to possible change in weather patterns, should be studied and considered. We believe this justifies Plan 1 and will help 5 to achieve the major objective of flood protection. The proposed plans increase the release rates and extends the time period. We feel that this will intensify an already serious streambank erosion problem. We request that these increased flows be evaluated with regard to increased stream bank erosion. Where stream bank erosion is a problem, or where it is anticipated to be a problem, we request that appropriate measures be taken to provide the necessary erosion control.

Sincerely,

Dale M. Uehling

Dale M. Uehling, Chairman
Ag Committee, Ottumwa Chamber of Commerce.

SW
ACCREDITED

1. With a conservation pool at elevation 734 feet NGVD, there will be about a 4-percent loss of flood control storage over the present condition.

2. Noted.

3. Our study is based upon existing records and experienced conditions which are the best available information. Our long-term predicted sedimentation rate is 4,000 acre-feet per year as compared to our experienced rate of about 5,000 acre-feet per year. We have examined precipitation records dating back to 1873 which show irregular patterns of wetter and drier than normal periods. These records are used in formulating our long-term predictions.

4. Noted.

5. Changes in the discharge rate will not measurably effect downstream bank erosion.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

August 12, 1987

Colonel Neil A. Smart, USA
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

ATTN: Planning Division

Dear Colonel Smart:

RE: Draft Water Control Plan and Environmental Impact Statement Red Rock Lake, Iowa

1 In accordance with our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act, we have reviewed the draft Supplemental Environmental Impact Statement (DSEIS) for the plan referenced above and have rated it LO-2 (Lack of Objections-Insufficient Information). Although we generally concur with your selection of Alternate 2 Plan 3, a major concern and the basis for our "2" rating is the failure of the DSEIS to mention the possibility that plan implementation may require cost-sharing for the proposed modifications to the recreational facilities, if indeed this is a real possibility. Such a policy could result in significant impacts to the user public. Therefore, we request that this matter be presented to the public for comment and resolved prior to finalization of the EIS.

Other of our concerns of a lesser nature are enclosed. Questions on any of these comments can be directed to Mr. Mike Bronoski of my staff at (913) 226-2823. Thank you for the opportunity to review and comment on this project.

Sincerely yours,

Katherine Biggs

B. Katherine Biggs
Chief, Environmental Review Branch

Enclosure

1. Noted.

2. Relocations of recreation facilities made under our operation and maintenance authority do not have to be cost-shared.

Draft Water Control Plan and Environmental Impact Statement Red Rock Lake, Iowa

Other Comments

3 4.2.1.4.2., second sentence beginning "Fauna in these areas....": This sentence is misleading because more than likely, the adjacent habitats are at carrying capacity. The result is that some wildlife will be lost, and this loss should be discussed in the EIS.

4 4.2.2.4.: This discussion of the impacts on aquatic resources of a single-step pool raise fails to recognize the possibility that the plan will likely create another "boom and bust" scenario among the reservoir fishery. State fish and game departments have just recently realized the problems created by this phenomenon to the extent that they are continually evaluating methods to flatten out the peak (boom). Any other alternative which would stage the pool raise, such as selected Alternative Plan 3, would mediate this impact.

3. Refer to the corrected section in the SEIS.

4. Refer to the corrected section in the SEIS.

BURLINGTON NORTHERN RAILROAD

1230 East Diehl Road
Naperville, Illinois 60540

Dudley M. Hanson, P.E.
Chief, Planning Division
U.S. Army Engineer District
Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

August 13, 1987
118550

SUBJECT: Proposed Lake Red Rock Changes

Dear Mr. Hanson:

Burlington Northern Railroad appreciates your furnishing the draft Water Control Plan and Supplemental Environmental Impact Statement for the Lake Red Rock, Iowa and is concerned with the impact upon railroads issue raised in U.S. DOT Regional Director H.T. Paton's July 2 letter to you.

1 We have reviewed our groundline profiles between Knoxville and DesMoines, Iowa. The maximum flood pool at Elevation 780 is to be kept the same as originally designed. Our lowest top/tie elevation is on the Whitebreast Creek fill and Bridge 36.14 at Elevation 788, so we have eight feet over maximum pool. Since the embankment was rip-rapped when the the project was originally constructed around 1969, we would require extra rip rap to protect the railroad property against wave action resulting from a higher pool.

We will appreciate your keeping Burlington Northern aware of the progress of the project.

Sincerely,

J.A. Leeper

J.A. Leeper
Regional Chief Engineer

0210e/69
GEK

1. The pool raise to elevation 734 feet NGVD, with the improved regulation plan, will not significantly change the frequency of flooding or the effects of wave action at Lake Red Rock at elevations above 750 feet NGVD. There will be no significant impacts to railroads.

CHICAGO AND NORTH WESTERN TRANSPORTATION COMPANY

Assistant Division Manager
Engineering

August 18, 1987
File: 313.1

District Engineer
U. S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building - P. O. Box 2004
Rock Island, Illinois 61204-2004

Gentlemen:

I would like some information on the planned Red Rock Reservoir pool elevation raise. I am specifically interested in any effects this raise will have on the Chicago and North Western Railroad property in Warren and Marion Counties.

1 I recently attended a public meeting on the Des Moines Recreational River and Greenbelt Project, held in Boone, Iowa, on August 3, 1987. At that meeting we were told that the Red Rock Reservoir is to be raised in two steps, from its existing elevation of 728.0 to a proposed elevation of 742.0. The first raise is to begin late in 1987. I would appreciate a more detailed schedule on the planned pool raise, including the elevation that the pool is to be raised to in 1987, as well as the approximate date on which the reservoir will be raised to the 742 foot level.

2 We are also interested in any effect the larger reservoir will have on our railroad. I have enclosed a map of the area of which I have shown Chicago and North Western tracks in yellow. We are particularly concerned about the crossing we have over the South River in Section 3, Township 77 north, range 22 west in Warren County. Our embankment at that location is unstable, and we are wondering if the level of the South River will rise in the area. Our records show our track near the river is at an elevation of approximately 775.0.

I will appreciate any information you can supply on this project. If I can provide any additional data, please contact me.

Very truly yours,

J. C. Domski
Assistant Division Manager
- Engineering

JCD/M

Attachment (1 Map)

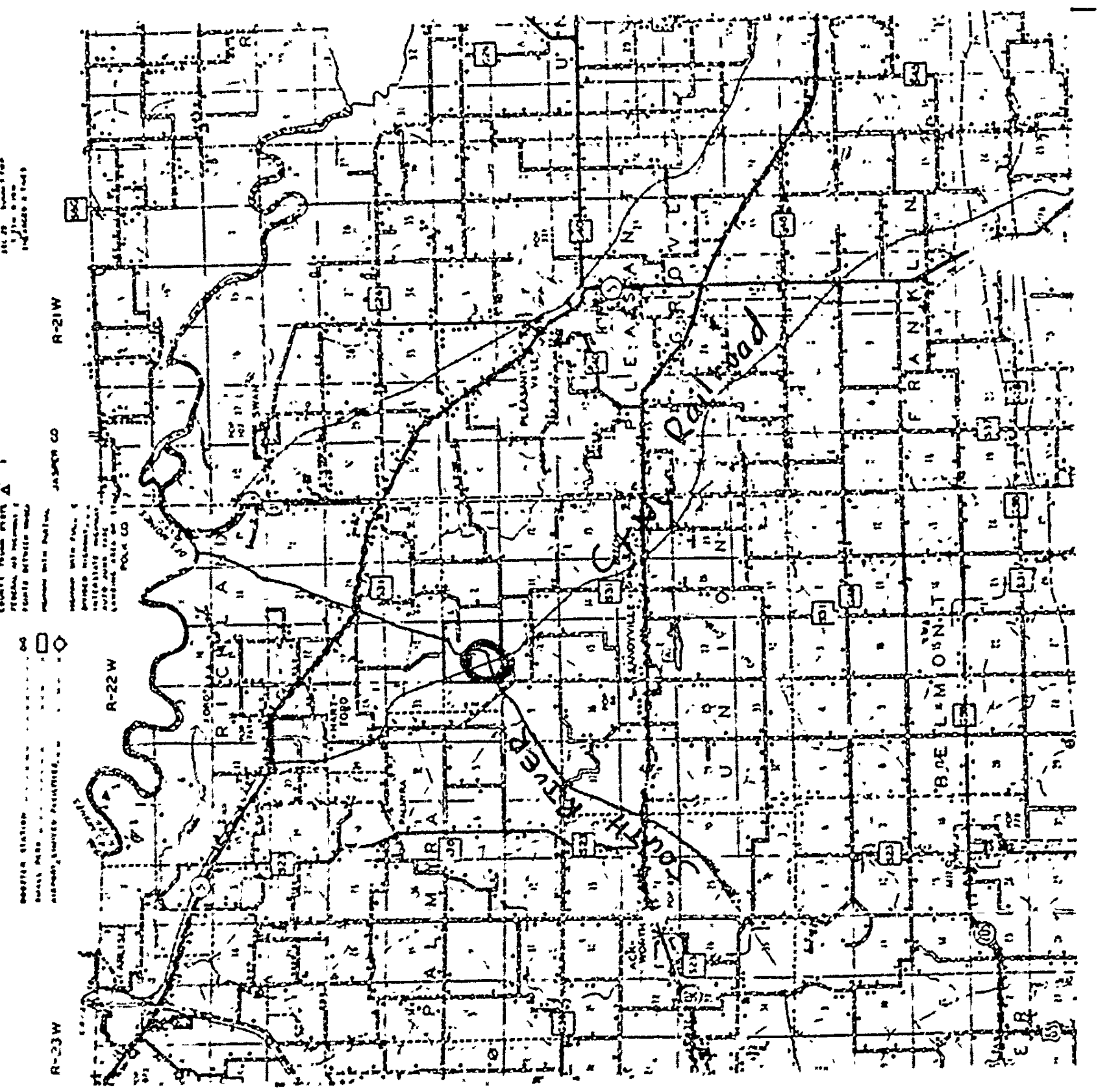
cc: T. L. Gaskill

E039

900 Story Street - Boone, Iowa 50036

1. The pool will be raised to elevation 734 feet NGVD in 1988, following the completion of the administrative processing for the report. Any subsequent raises would be done in accordance with an agreement yet to be established with the State of Iowa.

2. All required railroad relocations were accomplished prior to the construction of Lake Red Rock. In accordance with our relocations contract with the Chicago, Rock Island and Pacific Railroad, the 8,080 feet of railroad crossing Section 3-77-22 was raised above elevation 783 feet NGVD.


R-23W
R-22W
R-21W
OTLEY
JASPER CO
POLK CO

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
230 S. DEARBORN, SUITE 3422
CHICAGO, ILLINOIS 60604

August 25, 1987

ER 87/849

Colonel Neil A. Smart
District Engineer
Rock Island District, Corps of Engineers
Clock Tower Building
Post Office Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

(1) The Department of the Interior has reviewed the Draft Water Control Plan with Draft Supplemental Environmental Impact Statement for Lake Red Rock, Marion County, Iowa. We hereby provide consolidated Departmental comments for your consideration during continuing project planning efforts.

Personnel of the Bureau of Mines reviewed the subject document for possible impacts on mineral resources and mineral production facilities. The document concerns several alternatives for the operation and maintenance of Red Rock Dam in order to alleviate silting of the reservoir to an extent sufficient to retain a certain minimum required storage capacity. The most likely solution will probably be to raise the level of the reservoir less than a total of 14 feet in as yet undetermined increments over an extended period of time. Such action would permanently inundate additional areas, some of which are already affected in times of high water.

Lands in four counties, Marion, Warren, Polk, and Jasper, would be inundated by the increased water level. Deposits in Marion, Jasper, and Polk Counties yielded crushed stone, cement, gypsum, and coal. Coal and perhaps gypsum appear to be the mineral resources most likely to be affected by the proposed plan.

(2) The document makes no mention of mineral resources or mineral production facilities although it appears that mineral resources (coal and gypsum) occur within the reservoir area. Future versions of the document should describe the mineral resources and production facilities within the project area and environs, determine whether they would be impacted either adversely or beneficially, and propose mitigating measures to reduce or eliminate adverse impacts.

(3) The proposed project could have an impact on the Roberts Creek Area, which was developed with Land and Water Conservation Fund assistance through projects 19-00092 and 19-00326. It appears that any change in the water level of Red Rock Reservoir may have an effect on water-based recreation activities in the Roberts Creek Area.

1. Noted.

2. A discussion of mineral resources and production facilities has been added to the main report. There will be no impacts to these resources and mitigating measures will not be required.

3. The pool raise to elevation 734 feet NGVD will change the flood frequency from once in every 2.2 years to once in every 3.0 years. In considering the operational history of Lake Red Rock, the change in the conservation pool level will not have a significant enough impact to prompt a change in water-based recreation activities.

(4) The project sponsor should consult with the official who administers the Land and Water Conservation Fund program in the State of Iowa to determine the potential conflicts with Section 6(f)(3) of the Land and Water Conservation Fund Act (Public Law 58-578, as amended). Section 6(f)(3) states: "No property acquired or developed with assistance under this section shall, without the approval of the Secretary (of the Interior), be converted to other than public outdoor recreation uses." The administrator of the Land and Water Conservation Fund program for the State of Iowa is Mr. Larry J. Wilson, Director, Department of Natural Resources, Wallace State Office Building, East Ninth and Grand Streets, Des Moines, Iowa 50319.

(5) The Fish and Wildlife Service (Service) concurs with the selected alternative plan that provides for a two-stage conservation pool raise. The Service is pleased that the district is proposing to provide additional flexible fall pool raises for the purposes of fish and wildlife management.

(6) The draft Fish and Wildlife Coordination Act report on this project, dated December 12, 1986, also included recommendations for mitigation features, including fee title acquisition of existing flowage easement tracts in the reservoir flood pool. We note that fee title acquisition of flowage easements from willing sellers is currently underway at this project pursuant to Public Law 99-190. It is our understanding that the newly acquired tracts will be offered to the Iowa Department of Natural Resources as an addition to its existing outgrant agreement. Although the acquisition authority is unrelated to the water control study, the resulting increase in wildlife management capability will help to offset terrestrial wildlife habitat losses associated with the pool raises.

(7) A General Plan for Fish and Wildlife conservation was approved for this project in 1967. The plan indicates that the Secretary of the Interior has determined that Lake Red Rock has value to the national migratory bird program. The recommended plan will provide additional migratory bird benefits, and the Federal, non-reimbursable costs associated with this nationally significant resource should be included if any cost sharing obligations are calculated for the recommended plan.

Sincerely,

Sheila Minor Huff

Sheila Minor Huff
Regional Environmental Officer

4. The pool raise will not result in the conversion of land use at Robert's Creek County Park.

5. We will initiate the seasonal pool variations study following completion of the Water Control Plan.

6. Outgrant arrangements for lands acquiured under the authority of Public Law 99-190 will be determined at the appropriate time in the future.

7. The recommended plan will not require cost-sharing.

DES MOINES RIVER
WATER RESOURCE DISTRICT

Wallace State Office Building / Des Moines, Iowa 50319
Telephone: (515) 281-5564

August 27, 1987

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Division - P.O. Box 2004
Rock Island, IL 61204-2004

Dear Colonel Smart:

This letter concerns the sedimentation of Lake Red Rock, located on the Des Moines River near Knoxville, Iowa and operated by the U.S. Army Corps of Engineers as a multi-purpose reservoir.

Draft study reports recently issued by the Corps of Engineers (Draft Water Control Plan and Draft Supplemental Environmental Impact Statement - June, 1987) document the extent of sedimentation occurring since operation of Lake Red Rock was initiated in 1969. Four percent (79,650 ac ft) of the initial Lake Red Rock storage volume has been lost to date through sediment accumulation. This sedimentation has reduced recreational opportunities and aquatic habitat, has created aesthetic problems, and has reduced the capability of the reservoir to provide low-flow augmentation during drought conditions. The conservation pool was initially established at elevation 725 ft NGVD and has been raised in 1976 to elevation 728 ft NGVD. The conservation pool was originally designed at a 100 year sediment storage level of 742 ft NGVD. Because of the higher rate that sedimentation is actually occurring in the reservoir, the Corps of Engineers is currently proposing a two-step raise of the conservation pool to the 100 year sediment storage level of 742 ft NGVD.

1 To date the study undertaken by the Corps of Engineers (Draft Water Control Plan and Supplemental Environmental Impact - June 1987) to evaluate alternative actions for assuring that the reservoir continues to meet the project objectives and purposes for the design 100 year life has considered only alternatives for managing the sediment inflow to the reservoir. Instead of limiting consideration to proposals for managing the sediment inflow and relying on continuing increases of the conservation pool, the Corps of Engineers should initiate efforts to reduce sediment loading to the reservoir. A study should be initiated to identify alternative actions which can be taken to reduce sedimentation of the reservoir. The study

1. We have evaluated sediment sources in a report entitled "Sediment Studies Above Lake Red Rock" prepared by Iowa State University in June 1985. We currently are not funded to study methods for reducing sedimentation at Lake Red Rock. Agencies such as the Soil Conservation Service may be more able to examine these problems.

should include identification of tributaries with the highest sediment load contributions and critical areas of erosion and sediment production. Alternative control measures for reducing sedimentation from these critical areas and high sediment load tributaries should be formulated and evaluated.

Reducing critical area erosion and sedimentation will assist to ensure that the Lake Red Rock project meets the project objectives as well as reduce the other water and land resource damages associated with excessive sedimentation. The public interest in the important water resource of the Des Moines River and tributaries as well as Lake Red Rock will best be served through initiating a study of alternatives for reducing the sediment loads to the reservoir.

Sincerely,

Edward Klodt

Edward Klodt, Chairman
Des Moines River
Water Resource District Board

CHICAGO AND NORTH WESTERN TRANSPORTATION COMPANY

STRUCTURES DEPARTMENT

August 28, 1987

Mr. H. T. Paton
Regional Director
U.S. Department of Transportation
Room 1806
911 Walnut Street
Kansas City, MO 64104

Re: Draft Water Control Plan - Lake Red Rock, Iowa

Dear Mr. Paton:

Please refer to Mr. Hanson's letter to you dated July 21, 1987 concerning the impact of the Draft Control Plan on our railroad. After reviewing the Draft Control Plan, we find two major areas of impact.

Potential Impact Areas

1 - White Breast Creek Reach

This is our MP 43-43.5 with an approx. T/R elevation at 805±. This is currently a severe soils problem area "Nepas Slide" which is compounded by the presence of an abandoned coal mine. The original Corps. of Engineer protection, involved the construction of an impervious toe berm at elev. 783. This toe berm has since disintegrated and is no longer effective. An active global slope failure plane exists in the embankment. Any increase in the flood pool elevation seriously degrades the foundation support characteristics of the highly plastic subgrade soils and induces further sliding.

2 - South River Reach

This is our MP 56-57 with an approx. T/R elevation at 785±. This is currently a serious soils problem area "Miracle Mile". The original Corps of Engineers protection involved the relocation and raise in the grade from 775± to 785±. The embankment was constructed of highly plastic soils, was not benched into the existing grade, and was constructed with an unknown degree of moisture and density control. We are experiencing subgrade support failures indicating a factor of safety approaching unity. Again, an increase in the flood pool elevation would degrade the support characteristics of the highly plastic soils and further reduce the factor of safety.

ONE NORTH WESTERN CENTER / CHICAGO, ILLINOIS 60606

1. We are only planning to increase the conservation pool. The maximum flood pool elevation of 780 feet NGVD will not change.

2. See No. 1 above.

(3) Current estimates put forth in the draft control plan indicate the flood pool elevation of 780 has a 50 year return period. An increase in the conservation pool from 728 to 742 would drastically reduce this return period and incrase the likelihood we would experience failures at our two problem areas.

We would like a revew of reconstruction or protection measures for the two locations noted above.

Sincerely,

D. L. Boger.
Vice President - Engineering

cc: Mr. Dudley M. Hanson
Chief, Planning Division
Rock Island District
Corps of Engineers
Clock Tower Bldg.
P.O. Box 2004
Rock Island, IL 61204-2004

Mr. J. A. Leeper
Regional Chief Engineer
Burlington Northern Railroad
1230 E. Diehl Road
Naperville, IL 60566

Mr. W. W. Simpson
Senior Vice President & Chief Engineer
Norfolk Southern Corporation
Norfolk, VA 23510-2191

3. As shown in the draft report on plates A-10 and A-11, the pool raise alternatives will not significantly change flood frequency or duration above elevation 750 feet NGVD. A conservation pool raise to elevation 734 feet NGVD would cause impacts comparable to the other alternatives below elevation 750 feet NGVD. Flooding at elevation 780 feet NGVD will continue to have approximately an 100-year return period.

United States Department of Agriculture | Soil Conservation Service | 693 Federal Building
210 Walnut Street
Des Moines, Iowa 50309

August 31, 1987

District Engineer
U.S. Army Engineer District
Rock Island
ATTN: Planning Division
Clock Tower Building
P.O. Box 2004
Rock Island, Il 61204-2004

Dear Sir:

(1) The following comments are being provided for the draft water control plan with draft supplemental environmental impact statement for Lake Red Rock, Iowa, dated June 1987. The Soil Conservation Service is concerned about soils with high erosion rates which contribute sediment to downstream areas. High soil erosion rates damage water quality and result in many off-site damages such as decreased wildlife habitat, decreased fish and wildlife resources, and decreased opportunities for recreation.

(2) Raising Lake Red Rock to Elevation 742 may not provide a long term escape from the current sedimentation problem. It appears that by the year 2014 at the current rate of sedimentation (ie. 5,000 acre feet per year), a volume of sediment equal to the total volume below Elevation 742, approximately 230,000 acre feet, will have been deposited in the lake area. A large portion of this sediment will be deposited below elevation 742.

(3) Three of the major tributaries, White Breast Creek, Middle River and South River, while constituting only 24 percent of the uncontrolled area, contribute over 50 percent of the sediment to the lake. Several existing programs could provide assistance in addressing these erosion problems. To control the sedimentation problem to Lake Red Rock, immediate action is needed to insure implementation within a 10-year period. We recommend that consideration for this type of action be given a high priority in your agency. The Food Security Act of 1985 will have a significant impact upon reservoir sedimentation, especially through the installation of conservation management practices such as conservation tillage, contouring, and stripcropping. Another program which could provide some relief is the Small Watershed Act, Public Law 83-566. The involvement of PL 83-566 will be dependent on future condition scenarios determined by Food Security Act participation and Administration water resource policy. Additional funding would be needed to provide planning and installation assistance necessary to complete this project within a ten year period. We recommend the following priorities for action:

(4) 1. Provide land treatment to all small direct drainage area tributaries entering the Lake Red Rock area such as Calhoun Creek, Brush Creek,

1. Noted.

2. Noted.

3. Noted.

4. We will fully cooperate with the Soil Conservation Service to reduce sedimentation at Lake Red Rock. However, it should be noted that we do not have funding and only limited authority to take action beyond the bounds of Lake Red Rock.

and Walnut Creek. Require that not less than 75 percent of the erosion area have conservation practices installed to adequately protect the soil resource base.	
(5) 2. Concurrent with these actions, we recommend that watershed applications be filed for the South River and the Middle River to include at least 250,000 acres or the SCS limitation for approval authority on these projects. Require that not less than 75 percent of the drainage area above all structural measures have conservation practices installed to adequately protect the structures from sediment and to protect the soil resource base.	5. See No. 4 above.
(6) 3. Provide additional technical assistance through the Food Security Act for planning these watersheds to insure land treatment installation prior to 1995.	6. See No. 4 above.
(7) 4. Prepare a Watershed Protection Project Plan for White Breast Creek. There is an existing Public Law 83-566 application for White Breast Creek on file. This application could provide for inclusion of additional area. Require that not less than 75 percent of the drainage area above all structural measures have conservation practices installed to adequately protect the structures from sediment and protect to the soil resource base. Small structures on these particular streams could provide sediment storage in addition to a land treatment approach.	7. See No. 4 above.
(8) 5. Divide the South Raccoon River drainage area into small tributaries, especially those which enter on the south side of the South Raccoon River. Request planning authorization through Public Law 83-566 from the Soil Conservation Service on these small watersheds, provide planning assistance, and complete all installation no later than 1997.	8. See No. 4 above.
(9) The North Raccoon River drainage area could best be handled by on-going programs and through Food Security Act initiatives. A significant reduction in erosion and sedimentation can occur through application of conservation management practices.	9. Noted.
(10) We have considered the gross erosion and sedimentation going into Lake Red Rock and feel that the actions as proposed above would reduce sedimentation into Lake Red Rock by about 50 percent, a very significant amount. The cost to do this will be high. However, benefits through agricultural, fish and wildlife, and recreational purposes are available to justify such actions. Water quality and off-site impacts will also increase benefits.	10. Noted.
(11) We suggest meeting with you to discuss possible opportunities for carrying out these actions. We all have responsibility in helping to control the sediment going into Lake Red Rock, including the Corps of Engineers, the Soil Conservation Service, and the State of Iowa.	11. Note: Several meetings have since been held, as proposed by the State Conservationist.

(12) Our concern is that a positive approach be taken to insure that this resource is available to Iowans for a long period of time. We feel that extending the life of this valuable resource in Iowa is a top priority and deserves all of our best efforts.

If we can be of assistance in helping to develop and implement a plan of action, please let me know.

Sincerely,

Richard J. Murray, acting
J. Michael Nethery
State Conservationist

12. Noted.

US Department of Transportation
Federal Railroad Administration

400 Seventh St. S.W.
Washington, D.C. 20590

Room 1806
911 Walnut Street
Kansas City, Missouri 64106

September 29, 1987

Colonel Neil A. Smart
District Engineer
U. S. Army Engineer District
Rock Island
Attn: Planning Division
Clock Tower Building - P. O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

The increase in the amount of water contained in the conservation pool of Lake Red Rock in Iowa as proposed by the U. S. Army Corp of Engineers in the Draft Water Control Plan will affect railroad transportation.

(1) When the dam and reservoir was constructed, the railroads were rerouted on roadbeds provided by the U. S. Army Corp of Engineers. Several high earthen fill sections on the railroad route relocations were constructed with plastic soils. These fill sections have deteriorated and their unstable condition (2) poses a threat to railroad safety. The proposal to raise the level of the conservation pool from 728 feet to 742 feet will adversely impact the stability of the fill sections.

(3) Another factor that must be considered with the raising of the lake level is a reduction in the recurrence interval of a maximum flood. The time period should be calculated by the U. S. Army Corp of Engineers and furnished to all concerned. (4) The recurrence interval is important as part of the Carlisle to Indianola, Iowa, railroad route will be under water and out of operation when maximum flooding occurs.

1. Noted.

2. The frequency of flooding at elevations above 750 feet NGVD with an elevation 734 feet NGVD conservation pool will not significantly change. If portions of the fill sections are below elevation 750 feet NGVD, additional analysis may be required.

3. Flooding at elevation 780 feet NGVD (maximum flood pool) will continue to have approximately an 100-year return period.

4. We paid damages to the Chicago, Rock Island and Pacific Railroad in lieu of raising a portion of the Carlisle to Indianola route. The recurrence interval will not change for the elevation of the railroad. Thusly, the pool raise will not have an impact upon this line.

5 We believe Mr. D. L. Boger, Vice President Engineering, Chicago and North Western Transportation Company has legitimate concerns about the proposal to raise the conservation pool of Lake Red Rock. A copy of his letter to me is attached and we recommend the U. S. Army Corp of Engineers investigate these concerns and take measures to insure continued railroad operation when increasing the volume of the conservation pool.

5. Noted.

Sincerely,

H. T. Paton
Regional Director

Attachment

cc: Mr. J. A. Leeper
Regional Chief Engineer
Burlington Northern Railroad
1230 E. Diehl Road
Naperville, IL 60566

Mr. P. R. Rudder
Senior Vice President & Chief Engineer
Norfolk Southern Corporation
Norfolk, VA 23510-2191

Mr. D. L. Boger
Vice President, Engineering
Chicago and North Western Transportation Co.
One North Western Center
Chicago, IL 60606

CHICAGO AND NORTH WESTERN TRANSPORTATION COMPANY

STRUCTURES DEPARTMENT

August 28, 1987

Mr. H. T. Paton
Regional Director
U.S. Department of Transportation
Room 1806
911 Walnut Street
Kansas City, MO 64104

'87 SEP -9 A9:46

Re: Draft Water Control Plan - Lake Red Rock, Iowa

Dear Mr. Paton:

(1) Please refer to Mr. Hanson's letter to you dated July 21, 1987 concerning the impact of the Draft Control Plan on our railroad. After reviewing the Draft Control Plan, we find two major areas of impact.

Potential Impact Areas

- White Breast Creek Reach
  This is our MP 43-43.5 with an approx. T/R elevation at 805±. This is currently a severe soils problem area "Nepas Slide" which is compounded by the presence of an abandoned coal mine. The original Corps. of Engineer protection, involved the construction of an impervious toe berm at elev. 783. This toe berm has since disintegrated and is no longer effective. An active global slope failure plane exists in the embankment. Any increase in the flood pool elevation seriously degrades the foundation support characteristics of the highly plastic subgrade soils and induces further sliding.

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  This is our MP 56-57 with an approx. T/R elevation at 785±. This is currently a serious soils problem area "Miracle Mile". The original Corps of Engineers protection involved the relocation and raise in the grade from 775± to 785±. The embankment was constructed of highly plastic soils, was not benched into the existing grade, and was constructed with an unknown degree of moisture and density control. We are experiencing subgrade support failures indicating a factor of safety approaching unity. Again, an increase in the flood pool elevation would degrade the support characteristics of the highly plastic soils and further reduce the factor of safety.

ONE NORTH WESTERN CENTER / CHICAGO, ILLINOIS 60606

1. See the responses for the original letter, dated 28 August 1987 (located elsewhere in the appendix).

Current estimates put forth in the draft control plan indicate the flood pool elevation of 780 has a 50 year return period. An increase in the conservation pool from 728 to 742 would drastically reduce this return period and incrase the likelihood we would experience failures at our two problem areas.

We would like a revew of reconstruction or protection measures for the two locations noted above.

Sincerely,

D. L. Boger
Vice President - Engineering

cc: Mr. Dudley M. Hanson
Chief, Planning Division
Rock Island District
Corps of Engineers
Clock Tower Bldg.
P.O. Box 2004
Rock Island, IL 61204-2004

Mr. J. A. Leeper
Regional Chief Engineer
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1230 E. Diehl Road
Naperville, IL 60566

Mr. W. W. Simpson
Senior Vice President & Chief Engineer
Norfolk Southern Corporation
Norfolk, VA 23510-2191

INTRODUCTION

Individual comments were received during the July 7, 1987, public meeting held in Pella, Iowa, and from letters, postcards, petitions and comment sheets during the draft report review period. Comments were grouped under general headings and similar comments were combined where appropriate. There were a total of 397 individual commentors, some of which had more than one comment.

DOWNSTREAM COMMENTS

1. COMMENT: General interest only-no specific comment.

   # OF COMMENTORS: 3 of 397

   RESPONSE: Noted.

2. COMMENT: Downstream landowners will be flooded out by a release of 22,000 cfs. Shouldn't have to release over 17,500 cfs unless an emergency occurs.

   # OF COMMENTORS: 1 of 397

   RESPONSE: When 22,000 cfs has been released during the last 17 years, no major flooding has been observed downstream. Aerial photos have been taken to document the events.

3. COMMENT: Extending spring growing season releases is okay.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

4. COMMENT: Downstream tributaries should be considered more in control of releases.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Presently, the downstream tributaries are monitored using satellite gaging stations. Data is sent to a receiver site at Rock Island, Illinois, every 4 hours and the release rates are adjusted accordingly.

5. COMMENT: Why is there so much water below the dam?

   # OF COMMENTORS: 1 of 397

   RESPONSE: The amount of water downstream of Lake Red Rock is a combination of the water released from the dam and the inflow from tributaries. The uncontrolled tributaries can create flooding conditions separate from Lake Red Rock.

6. COMMENT: Why does the Corps continue to dredge sand from the Des Moines River below the dam? The sand works out from under the banks and they continue to fall in-resulting in people losing crop land.

   # OF COMMENTORS: 1 of 397

   RESPONSE: The Corps of Engineers does not dredge sand from the Des Moines River. Presently, private operators dredge sand and this activity is monitored by both the State of Iowa and the Corps of Engineers. Permits are issued which allow dredging to be done in specified areas and the operators are not allowed to undercut the banks.

7. COMMENT: Why didn't the Corps buy easements to land along both sides of the tail water, at least down to Highway 92?

   # OF COMMENTORS: 1 of 397

   RESPONSE: The initial authorization of the Lake Red Rock project did not provide for the purchase of flowage easements below the dam.

8. COMMENT: Any chance of building a dam between Red Rock and St. Francisville?

   # OF COMMENTORS: 1 of 397

   RESPONSE: We are not aware of any plans to build a dam between Lake Red Rock and the city of Francisville, and we believe that it is unlikely that such a project would be undertaken in the foreseeable future.

UPSTREAM COMMENTS

1. COMMENT: I favor any pool level raise.

   # OF COMMENTORS: 5 of 397

   RESPONSE: Noted.

2. COMMENT: Look at the whole watershed (to minimize siltation).

   # OF COMMENTORS: 6 of 397

   RESPONSE: The Corps of Engineers has no funding or authority to control erosion in the entire watershed. General information regarding sediment yield from various areas is available from previous Corps of Engineers studies on file with the Rock Island District.

3. COMMENT: You can't be too concerned about silt in the lake. My kids farmed what was our land for several years. We had to sow hills down, and keep it in hay. We couldn't let a pony get out on it. Now for the last three or four years, you let people put corn on the hills. We plowed a good hay field this year. Got corn on all of it. What gives?

   # OF COMMENTORS: 1 of 397

   RESPONSE: Not enough specific information was given to respond to this comment. However, it should be noted that we have very limited authority regarding agricultural practices on (flood) easement lands, and no authority on non-Federal lands outside of the pool.

4. COMMENT: Seed areas susceptible to erosion (to reduce siltation).

   # OF COMMENTORS: 4 of 397

   RESPONSE: Erosion control techniques, including seeding, reforestation and structural stabilization, are employed on lands managed by the Corps of Engineers when practical.

5. COMMENT: The Corps seems to be playing favorites to the recreationists over flooded landowners.

   # OF COMMENTORS: 3 of 397

   RESPONSE: The primary purpose of Lake Red Rock is to reduce flooding downstream. The other purposes are for recreation, fish and wildlife, low-flow augmentation and hydropower. Flooding of land in the pool area is only done when water is being stored during a high water event. Our goal at Lake Red Rock is to minimize flood damage and maximize benefits.

UPSTREAM COMMENTS (Cont'd)

6. COMMENT: Why wasn't the normal pool set at a higher elevation when it was created in 1969?

   # OF COMMENTORS: 1 of 397

   RESPONSE: The original pool was set at elevation 725 feet NGVD with 90,000 acre-feet of conservation storage. This was divided into 50,000 ac-ft for low-flow augmentation and 40,000 ac-ft for for an initial sediment storage reserve. This amount of storage was adequate in 1969. The concept of the reservoir's operation was that it would be raised periodically to recover the sediment storage capability.

7. COMMENT: Do not encourage competition among and between recreation and agricultural interests.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

8. COMMENT: Do not raise the lake level.

   # OF COMMENTORS: 5 of 397

   RESPONSE: Noted.

9. COMMENT: Who does the Corps answer to?

   # OF COMMENTORS: 1 of 397

   RESPONSE: The Corps of Engineers reports to the Assistant Secretary of the Army (Civil Works), Washington D.C., 20310-0103.

10. COMMENT: How much sediment is deposited in the lake each year and what is being done to control sediment build-up?

    # OF COMMENTORS: 2 of 397

    RESPONSE: Approximately 5 million tons of sediment are trapped by the Red Rock dam each year. The major source of sediment is sheet erosion from agricultural areas which contribute runoff to Lake Red Rock. The Corps of Engineers has no funding or authority to manage most of this area. Erosion control techniques, including seeding, reforestation and structural stabilization, are employed when practical on lands managed by the Corps of Engineers.

11. COMMENT: An alternative to dredging could be pumping sediment to the surrounding farm hills.

    # OF COMMENTORS: 1 of 397

    RESPONSE: We have examined dredging at Lake Red Rock and have not found it to be economically justified. Pumping sediment to the surrounding farm hills is a type of dredging.

12. COMMENT: Why don't you flush the sediment from Lake Red Rock about every three years.

    # OF COMMENTORS: 1 of 397

    RESPONSE: Some sediment may pass through the reservoir. However, attempting to flush the pool will not remove a significant amount of deposited sediment.

13. COMMENT: Based on plan three, and the current history of sedimentation and discharge, when will an additional lake raise be necessary (above 742 NGVD)?

    # OF COMMENTORS: 1 of 397

    RESPONSE: We predict that a conservation pool at elevation 742 feet NGVD would be able to maintain minimum low-flow augmentation until the year 2069.

14. COMMENT: The minimum that should be done is exercise the authority already given to the Rock Island District, Corps of Engineers and that is to raise the lowest lake level to 732 feet. Immediately.

    # OF COMMENTORS: 1 of 397

    RESPONSE: Noted.

15. COMMENT: How can you guarantee the same flood protection at different levels?

    # OF COMMENTORS: 1 of 397

    RESPONSE: About 1.75 million acre feet of flood storage are available in the maximum flood pool. With a conservation pool set at elevation 734 feet NGVD, historic floods would have reached the same maximum elevation because of the available storage capacity and the new release rates that are triggered at high pool levels.

UPSTREAM COMMENTS (Cont'd)

16. COMMENT: What effect does the sedimentation rate have over the life of Lake Red Rock, originally designed with a 100-year life?

    # OF COMMENTORS: 1 of 397

    RESPONSE: Flood control storage will not be significantly impacted by the 100-year sediment storage. The accumulation of sediment in Lake Red Rock will significantly reduce recreation and low-flow benefits. Two additional points are pertinent: (1) the sediment rate may change in the future as a result of changed land management practices; and (2) the term "100-year life" is not meant to convey that the lake will only last 100 years. Lake Red Rock will operate for hundreds of years regardless of future sediment rates.

17. COMMENT: Why didn't the Corps dam up the little creeks to hold sediment back in the first place?

    # OF COMMENTORS: 1 of 397

    RESPONSE: The proposal would provide a very costly solution, relative to the benefits achieved, and suitable sites on the tributary streams are not generally available. Funding and authority for a Corps of Engineers project of this nature does not exist. We do participate with technical support to Department of Agriculture programs which relate to these types of proposals.

18. COMMENT: What about the terrible time getting down around to the main stream from the mile-long bridge?

    # OF COMMENTORS: 1 of 397

    RESPONSE: The conservation pool raise to elevation 734 feet NGVD will provide easier access in the area of the mile long bridge.

19. COMMENT: The water quality needs improving. There is a need to sample the silt and to see how much sewage is coming out of Des Moines.

    # OF COMMENTORS: 3 of 397

    RESPONSE: The water quality at Lake Red Rock is analyzed periodically throughout the year. In addition, the sediment has been analyzed for various pollutants on occasion. By and large, the majority of chemical pollution entering the lake is agricultural in origin. During periods of extreme low-flow, domestic sewage comprises a significant portion of the contaminants entering the lake, but this is the exception rather than the rule.

UPSTREAM COMMENTS (Cont'd)

20. COMMENT: There is a need to improve water quality with permanent soil conservation practices.

    # OF COMMENTORS: 2 of 397

    RESPONSE: The Corps of Engineers has the authority to regulate land use practices below elevation 760 NGVD. This represents approximately 55 square miles. The entire basin draining into Lake Red Rock is approximately 12,000 square miles. Thus, the Corps of Engineers has the ability to regulate activities affecting soil loss on less than 1 percent of the drainage basin. The Department of Agriculture and the Soil Conservation Service are in a better position to implement actions to control soil loss, and we cooperating with these programs to the extent of our capabilities.

21. COMMENT: How many tons of sewage goes into the Des Moines River everyday?

    # OF COMMENTORS: 1 of 397

    RESPONSE: The city of Des Moines does not discharge raw sewage to the Des Moines River on a routine basis. Only during periods of very intense rainfall or when equipment fails there is a bypass into the river. It was reported that during 1986 some untreated sewage was by-passed to the river on 51 days (see the IDNR letter, dated July 16, 1987, located elsewhere in the appendix).

22. COMMENT: How much storage was there between elevations 728 and 742, and how many acres would be flooded?

    # OF COMMENTORS: 1 of 397

    RESPONSE: The amount of storage between elevation 728 and 742 feet NGVD is 191,000 acre-feet. At elevation 728 feet NGVD, 6,875 acres are inundated as compared to about 19,000 acres at elevation 742 feet NGVD.

23. COMMENT: The real problem is rapid runoff of rainfall. A solution is the draining of swampy land by tiling should cease and some of the tiling removed.

    # OF COMMENTORS: 1 of 397

    RESPONSE: Noted.

EASEMENT COMMENTS

1. COMMENT: Concern over frequency of flooding versus predicted estimates.

   # OF COMMENTORS: 5 of 397

   RESPONSE: Reference is made to Table 3, Frequency of Flooding on Easement Lands, on page 17 of the draft report. Lake Red Rock has flooded more often than the predicted long-term average.

2. COMMENT: How receptive are landowners to the purchase of easement ground?

   # OF COMMENTORS: 1 of 397

   RESPONSE: We have not conducted a survey to determine landowner interest and, therefore, we do not know the degree of willingness to sell.

3. COMMENT: When do you plan to begin buying easement lands?

   # OF COMMENTORS: 2 of 397

   RESPONSE: We are awaiting the approval of the Assistant Secretary of the Army (Civil Works) prior to acquiring easement lands under the authority of Public Law 99-190.

4. COMMENT: What are your plans if the landowners do not wish to sell easement grounds?

   # OF COMMENTORS: 1 of 397

   RESPONSE: Under the authority of Public Law 99-190, we will only acquire lands from willing sellers. If an easement land owner is not willing to sell, we will take no further action in that regard.

5. COMMENT: Since the government is sponsoring programs to decrease the amount of crops produced through its set aside programs, why do they continue to rent land around the lake (in the flood area)?

   # OF COMMENTORS: 1 of 397

   RESPONSE: Most of the lands which are leased at Lake Red Rock are used for crop production by the Iowa Department of Natural Resources for fish and wildlife management purposes.

EASEMENT COMMENTS (Cont'd)

6. COMMENT: It is my understanding that money from leased farm land goes to the Marion Co. school system. If the Corps raises the lake there will be less land leased, so where will the school system get its money?

   # OF COMMENTORS: 1 of 397

   RESPONSE: Funding for Marion County schools is a matter of local responsibility. The question would have to be addressed to the appropriate unit of local government.

7. COMMENT: Can the government excuse taxes on flooded farm acreages if the Corps does not buy the easement property?

   # OF COMMENTORS: 1 of 397

   RESPONSE: The question would have to be directed to the appropriate unit of local government.

8. COMMENT: Have you considered expanding up the tributaries on the buying of easement land?

   # OF COMMENTORS: 1 of 397

   RESPONSE: In accordance with Public Law 99-190, we will investigate the purchase of all easement lands at Lake Red Rock.

9. COMMENT: Not in favor of a pool raise unless Corps can give definite assurance that easement land will not be flooded more frequently by the pool raise.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Reference is made to Table 7, Upstream Flood Frequency at Different Conservation Pool Levels, in the draft report. The table indicates that there will be no significant changes in the frequency of flooding.

EASEMENT COMMENTS (Cont'd)

10. COMMENT: Concern over frequency of flooding and the compensation for the present value of the land. What is the fair market value? They are grossly understated now.

    # OF COMMENTORS: 1 of 397

    RESPONSE: The fair market value is defined as the amount in cash, or term equivalent to cash for which in all probability the property would be sold by a knowledgable willing owner to a willing knowledgeable purchaser.

11. COMMENT: Where do I find out the value of our property?

    # OF COMMENTORS: 1 of 397

    RESPONSE: The Corps of Engineers will be conducting appraisals of the willing sellers' properties starting several years from now and the value of the land will be announced in a letter to the landowner.

12. COMMENT: Why should the ICC continue to rent land for crop production when this country has overproduction now?

    # OF COMMENTORS: 1 of 397

    RESPONSE: Lands at Lake Red Rock are leased by the Iowa Department of Natural Resources (formerly ICC) from the Corps of Engineers for crop production for fish and wildlife management purposes.

13. COMMENT: The Corps should pay damages on easement lands when they are the one responsible for the flooding.

    # OF COMMENTORS: 1 of 397

    RESPONSE: The Federal government has already acquired the right to flood lands at Lake Red Rock by the purchase of flowage easements.

14. COMMENT: Expressed general interest only - no specific comment.

    # OF COMMENTORS: 3 of 397

    RESPONSE: Noted.

EASEMENT COMMENTS (Cont'd)

15. COMMENT: I would think we need to have some choices for the land owners to get back compensation. The people really didn't have a choice back in the late '60s. One choice could be a fee-simple buy-out. A second choice would be for those who do not want to sell the land to be able to renegotiate the easements and take care of the losses. Third, how about paying damages as they happen?

OF COMMENTORS: 1 of 397

RESPONSE: We have the authority to purchase easement lands under the authority of Public Law 99-190. Flowage easements were purchased on lands between elevation 760 and 783 feet NGVD for Lake Red Rock. Landowners were compensated at the time of the purchase of the easements. We do not have the authority to renegotiate easements or pay damages.

FISH AND WILDLIFE COMMENTS

1. COMMENT: Why isn't Lake Red Rock stocked with fish that can survive the muddy and changing water levels?

   # OF COMMENTORS: 1 of 397

   RESPONSE: Fishery management at Lake Red Rock is the responsibility of the Iowa Department of Natural Resources (IDNR). Current stocking at the lake is on an "as available" basis, utilizing walleye and northern pike fry. Because Lake Red Rock is an open river impoundment (versus a closed natural lake), stocked fish can leave the lake and river spec[illegible] can enter. It is the river species group that is most tolerant o[illegible] conditions and water level fluctuation. The current populations o[illegible] and buffalo are sizeable and support commercial fishing. Catfish are also tolerant of the conditions at the lake and form a substantial portion of the gamefish landed at Lake Red Rock.

2. COMMENT: If Lake Red Rock were cleaned up, it would look better and the quality of habitat would improve.

   # OF COMMENTORS: 2 of 397

   RESPONSE: Maintenance (clean up) is an ongoing Federal function at Lake Red Rock. As such, it is subject to Federal funding and manpower limitations which customarily preclude removal of debris from areas other than boat ramps, beaches, parking lots, and similar areas. It is anticipated that many of the main lake stumps and snags will be inundated with the elevation 734 feet NGVD conservation pool, improving both aesthetics and aquatic habitat at the lake.

RECREATION COMMENTS

1. COMMENT: Many people enjoy the lake and the lake area besides the farmers.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

2. COMMENT: I would enjoy sailing more if there was more water.

   # OF COMMENTORS: 2 of 397

   RESPONSE: Noted.

3. COMMENT: Plan two should be adopted in order to avoid duplication of recreation facilities such as beaches, boat ramps and parking lots.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

4. COMMENT: One concern on the pool raise is the West Wallashuck Recreation Area, particularly regarding the safety of the tenant's docking and mooring area at lake Red Rock Marina. (Especially when it storms and the water level is high.)

   # OF COMMETORS: 1 of 397

   RESPONSE: The conservation pool raise to elevation 734 feet NGVD will be beneficial to the west Wallashuck bay area. Boats will not be hampered by shallow water conditions as is presently the case.

PLAN PREFERENCE COMMENTS

1. COMMENT: Use plan one. Sedimentation would take place a long distance up the river, where it would be much easier to handle.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

2. COMMENT: Plan two, the one step raise to 742. should be adopted and implemented no later than 1989. This would allow the Corps of Engineers to negotiate flood rights once and for all. Costs would be paid for in today's dollars rather than in future dollars.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted. We do not have the authority to renegotiate flood easements as part of the pool raise.

3. COMMENT: The low-lying land will be flooded more frequently under plan two, but I believe now is the time to remove the farmland from production.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

4. COMMENT: Raise the pool to 742 NGVD in one-step. If the pool is raised in two or three steps, two or three times as much money will be wasted studying, surveying, taking samples and holding meetings.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

5. COMMENT: I favor plan two.

   # OF COMMENTORS: 5 of 397

   RESPONSE: Noted.

PLAN PREFERENCE COMMENTS (Cont'd)

6. COMMENT: I agree with the recommendation to raise the conservation pool at Lake Red Rock eight feet this year. I agree with Governor Branstad's recommendation that the level be raised to 742 feet NGVD within the next two years. (white postcards).

   # OF COMMENTORS: 201 of 397

   RESPONSE: Noted.

7. COMMENT: I favor plan three.

   # OF COMMENTORS: 11 of 397

   RESPONSE: Noted.

8. COMMENT: I would like to see the lake at elevation 736 NGVD.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

9. COMMENT: I favor plan five.

   # OF COMMENTORS: 3 of 397

   RESPONSE: Noted.

10. COMMENT: Raise the lake level as soon as possible.

    # OF COMMENTORS: 5 of 397

    RESPONSE: Noted.

11. COMMENT: Raise the water level slowly.

    # OF COMMENTORS: 1 of 397

    RESPONSE: Noted.

12. COMMENT: We feel that the Corps proposal fails to offer any solutions to the real problem of unacceptable sedimentation and thus increased levels continue to permit sedimentation. Also, we agree that the Corps immediately raise the permanant pool to 732 feet to equal inflow rates up to 22,000 cu. ft. sec. during crop seasons and 30,000 cu. ft. sec. during non-crop seasons, and strongly request that the Corps cooperate with landowners above and below the dam, recreational users, Congressional reps and various departments and agencies to develop long range solutions to the serious sedimentation problems and eliminate or minimize the necessity of future increases.

OF COMMENTORS: 92 of 397

RESPONSE: Noted.

MISCELLANEOUS COMMENTS

1. COMMENT: The Federal Government should absorb all [construction] costs of the pool raise.

   # OF COMMENTORS: 1 of 397

   RESPONSE: The conservation pool raise to elevation 734 feet NGVD will not not require any construction.

2. COMMENT: The Corp's goals in regard to Lake Red Rock should be to create and implement a long-term plan to reduce the flow of sediment deposited in the lake. The key is to stabilize the lake and improve it's longevity.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Most of the sediment is contributed from lands not controlled by the Corps of Engineers.

3. COMMENT: Recreational activity, and related safety concerns must not be overlooked to ensure a balance between Saylorville and Rathburn as our population grows.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

4. COMMENT: We need bank protection.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

5. COMMENT: When will there be a rise in the lake?

   # OF COMMENTORS: 1 of 397

   RESPONSE: The pool raise is currently scheduled for summer 1988.

6. COMMENT: Stop the city of Des Moines from extending their work on the sewer system.

   # OF COMMENTORS: 1 of 397

   RESPONSE: The city of Des Moines sewer system is outside of the authority of the Corps of Engineers.

MISCELLANEOUS COMMENTS (Cont'd)

7. COMMENT: Thanks for keeping the public well informed.

   # OF COMMENTORS: 2 of 397

   RESPONSE: Noted.

8. COMMENT: It took two and a half years to produce a four pound report on what will happen if Red Rock is raised to a level that it has reached twelve of it's eighteen years in existence.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

9. COMMENT: I am overjoyed to hear conservation people address the real problems concerning Lake Red Rock, but they shouldn't try to dump it on one agency - the Corps of Engineers. It can be shared and accomplished.

   # OF COMMENTORS: 1 of 397

   RESPONSE: Noted.

10. COMMENT: Raise the water level to make it practical for everyone.

    # OF COMMENTORS: 8 of 397

    RESPONSE: Noted.

11. COMMENT: Is the lake going to be cleaned up? We are concerned about the large amount of dead trees deposited around the shoreline.

    # OF COMMENTORS: 1 of 397

    RESPONSE: Cleaning the shoreline, as a Federal responsibility, is prohibitively expensive.

12. COMMENT: General interest only - no specific comment.

    # OF COMMENTORS: 22 of 397

    RESPONSE: Noted.

PERTINENT CORRESPONDENCE

A P P E N D I X I

WATER CONTROL PLAN
LAKE RED ROCK, IOWA

APPENDIX I
PERTINENT CORRESPONDENCE

Incoming Letters

Incoming Letters (Cont'd)

Incoming Letters (Cont'd)

Incoming Letters (Cont'd)

Incoming Letters (Cont'd)

NEAL SMITH
MEMBER OF CONGRESS
FOURTH DISTRICT, IOWA

Congress of the United States
House of Representatives
Washington, D.C. 20515

February 9, 1976

Lt. Gen. William C. Gribble, Jr.
Chief of Engineers
Department of the Army
Washington, D.C. 20314

Dear General Gribble:

Since the Lake Red Rock project on the Des Moines River became operational in 1969, I have urged the Corps to conduct a study to determine the feasibility of raising the permanent pool levels. I have felt it most important that such a review be made as soon as possible as even an increase of from 3 to 5 feet in the present level would very materially enhance the benefits to recreation and down-stream water quality, and provide water supply needed for pending power projects in the area.

To date the Corps has deferred undertaking such a study pending operational experience at Red Rock and the completion of the related Saylorville Dam and Reservoir projects upstream which will supplement the capacity of the Red Rock Reservoir.

Now that the Saylorville Project is nearing completion and the proposed changes in the project authorization have been determined, as outlined in the special report approved by you on September 18, 1975, it would seem to me that it would now be appropriate to undertake the proposed reevaluation of Red Rock.

It is my understanding, however, that the Corps now plans to hold up initiating such a restudy pending actual operational experience at the Saylorville Reservoir. Because of the widespread local interest and the very significant additional project benefits that are involved, I respectfully urge that the restudy be expedited in order that a final determination can be made at the earliest possible date.

Sincerely,

Neal Smith

Neal Smith
Member of Congress

NS:nrs

Iowa
...e to grow

Natural Resources Council

Wallace State Office Building
Des Moines, Iowa 50319
(515) 281-5913

JAMES R. WEBB, Director
LOUIS F. GIESEKE, Water Commissioner

December 5, 1978

Colonel F. W. Mueller, Jr.
District Engineer
Rock Island District, Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Mueller:

The Iowa Natural Resources Council will be preparing a formal request for a detailed study of possible reallocation of conservation storage in Saylorville and Red Rock Reservoirs for municipal and industrial water supply as part of your ongoing study of water demand and availability in the Des Moines River Basin. We plan to submit the request for detailed study (Item #2 of my April 5, 1978 letter to Colonel Lycan) to you this coming January.

The Council strongly urges that, in the interim, the conservation pool of Lake Red Rock be maintained at its current elevation of 728 feet M.S.L. through 1983.

Sincerely,

James R. Webb
Director

JRW/jfw/ay

Office of the Governor
STATE CAPITOL
DES MOINES, IOWA 50319

ROBERT D. RAY
GOVERNOR

April 27, 1978

Colonel Daniel J. Lycan
District Engineer
Corps of Engineers
Rock Island District
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Lycan:

When I visited with you and Fred Priewert during the Red Rock Lake meeting, we discussed the possibility of raising the conservation pool level at Red Rock.

I would like to have you consider this in view of last year's drought, the loss of storage due to sedimentation, and also the additional recreation available if the lake were at a higher level.

Your favorable consideration to this request would be very much appreciated.

Sincerely,

Robert D. Ray

Robert D. Ray
Governor

RDR:kjd

Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319
515/281-5145

An EQUAL OPPORTUNITY Agency

June 17, 1983

Colonel Bernard P. Slofer
Army Corps of Engineers
Clock Tower Building
Rock Island, IL 61201

Dear Colonel Slofer:

The Iowa Conservation Commission is very much interested in improving and expanding waterfowl habitat at Red Rock Wildlife Area again this year. To do this, we need a water elevation of 732.0 feet for the fall migration. On August 24 of last year, we made a similar request.

Waterfowl habitat has deteriorated considerably in the last three years. Silt has filled the lower end of the Red Rock Wildlife Area and our facilities for launching boats require a higher water elevation than 732.0 feet. The Conservation Commission has received several complaints from hunters and bird watchers for the low water levels during the fall at Red Rock.

There is a very critical need at this time for this pool raise in order to maintain waterfowl and shorebird populations. Our studies show at the 728.0 feet elevation there is only 300 acres of shallow water on the Red Rock Wildlife Area. At this level, only the river portion is accessible by boat. At the 730.0 feet elevation, the water area is increased to 1,000 acres. This improves the area for waterfowl food and feeding areas for wading birds; however, boat access is rather poor. At the 732.0 feet elevation, the water area is doubled which gives a total pool of 2,000 acres in the wildlife area.

Data collections and observations support this raise. A significant improvement in habitat conditions is very apparent at the 732.0 feet level, and the upper regions of this pool can be reached by boaters who want to hunt or observe waterfowl. Also, at this level the water is closer to the roads and provides more access points which makes observing wildlife easier for bird watchers. It is estimated that over 25,000 bird watchers and 5,000 waterfowl hunters use the Red Rock Wildlife Area during the period that fall migration takes place.

During our review of the Des Moines River Water Demand and Availability Study, we requested that serious consideration be given to a 732.0 feet

water level for the fall of the year. It was also stated in the letter from us and the Fish and Wildlife Service in anticipation of siltation, that a permanent pool of 732.0 feet elevation during winter, spring, and summer with a two-foot raise during the fall be considered when conditions warrant it. It is believed that it will be another five years before these conditions occur.

We appreciate the cooperation we have received from you in the past, and hope your response to this request is favorable. We are convinced that this management practice enhances waterfowl and shorebird habitat, and provides additional opportunities to the recreating public. We would welcome a meeting to discuss this request, or to assist your personnel in preparing the environmental documents necessary to facilitate this water level raise.

Sincerely,

LARRY J. WILSON, DIRECTOR
IOWA CONSERVATION COMMISSION

June 4, 1984

Commandant
U.S. Army Engineer District
Rock Island
Corps of Engineers
Clock Tower Bldg.
Rock Island, Illinois 61201

Dear Sir:

We, the undersigned, have experienced years of crop loss due to what we feel is poor operation of the Red Rock, Saylorville and Ottumwa Flood Control Projects.

As a result of high water:

1. We are flooded long past planting season and again at harvest. Many acres of crop are lost every year.

2. Extensive bank erosion.

3. Eddyville Sewer System cannot operate properly causing water to back up on farm land.

Since our tax dollars support all these projects, we feel more concern should be given to our land and our problems.

George and Mary Franklin
Rt. 1, Box 153
Eddyville, Iowa 52553

NAME	ADDRESS	ACRES AFFECTE
George & Mary Franklin	Rt. 1 Eddyville	135
J B Augustine	"	80
F. W. Klein	"	40
Bruce Day	"	75
Irene Engle	Eddyville R#2	39
Jack Hartman	Route 4 Ottumwa Ia	1~~#~~5
Michael Verhelst	Route 5 Ottumwa, Ia	50
Ronald Guiter R5	Ottumwa Ia	170

NAME	ADDRESS	ACRES AFFECTED
Greg A. Comstock	Eddyville Ia	400.
Edward A. Haigt	Rt. 5 Oskaloosa	100.
Larry & Sandra Glenn	R5 Ottumwa	125.
Kenneth Roberts	RR2 Eddyville, Ia.	240
Lowell W. McCracken	R1 Eddyville Iowa	120
David & Connie Burregar	R#4 Ottumwa	100
Richard Besco	Eddyville	125
Lona Lou Besco	Eddyville	
Glen Middlesworth	Ottumwa Rt 5	140
Glenn Pabst	Eddyville R2	108
thomas C Lane	Eddyville RR1	230
Michael L Boyer	Eddyville RR1	75
Henry Hoffman	R#5 Ottumwa	80
[illegible] W McNeer	RR2 Eddyville	36
Stephen De Ronde	RR1 Eddyville	105
Kryn De Ronde	RR5 Oskaloosa	250
[illegible] De Ronde	R.R.5 Oskaloosa	150
[illegible] Steegh Bros	RR5 Oskaloosa	800
Irwin Scott & Son	R.5 Oskaloosa	160
Cliff Heaton	R3 Oskaloosa	60

NAME	ADDRESS	ACRES AFFECTED
Wilbur L. Nunnikhoven	R#1 Leighton	142 acres
Lyle Nunnikhoven	R#5 Oskaloosa	40 acres
Bill Malin	R#1 Leighton Ia.	300 "
Leona Malin	R# Leighton	300
Frank G. Peters	R1 Leighton	408
Tunis E Kelderman	R 3 Oskaloosa	219 acres
Jeff Van Maanen	R 3 Oskaloosa	700 "
Uvin Van Maanen	R 3 Oskaloosa	700 "
Harold Rice	R 5 Oskaloosa	65
Paul De Bruin	University Park Oskaloosa	108
Bud Penning	Eddyville	120
Bob D Miller	R1 Eddyville	44
Don Groet	R1 Eddyville	50
Dean Heckenberg	R#1 Eddyville	60
Warren McGlothlen	R#1 Eddyville	80
Henry Veldhuizen	R#1 Eddyville	40
Bryce Veldhuizen	R#1 Eddyville	40
Duane Davis	R#1 Eddyville	150
Max Rupe	RR1 Eddyville	40
Melissa & Maurice Gardner	RR1	Ottumwa	220

Page 4
June 4, 1984
Commandant
U.S. Army Engineers Dist. Rock Island

NAME	ADDRESS	ACRES AFFECTED
Ron & Cheryl Teno	R.R.1 Box 324 Eddyville	40 acres
Stephen Arnold	R1 Eddyville	13 acres
Ronald Richard	Eddyville	
Fred Van Senbeen	Eddyville	260 acres.
Frank Comstock	RR 2 Oskaloosa	560 acres.
C. W. Shafer	RR#2 Eddyville	60 acres
Richard Johnson	R 3 Oskaloosa	520 acres
Verlan Hauenstein	R#1 Leighton Iowa	117 Acres
Mary E Hauenstein	R 1 Tracy	135 acres
Christian Church Farm	By Thomas C Lane Trustee	200 acres
Patrick Larkin	R.R.4 Ottumwa Ia.	70 acres.
Dale Hartman	RT. 1 BOX 10 St. Charles, Iowa PART-OWNER - RENTER	115 acres
Loren Guiter	Rt 5 Ottumwa	40
Raymond Liebus	115 8th Ave E. Oskaloosa	75
Jim Kaiser	RT 2 Ottumwa	35

Page #5
June 4, 1984
Commandant
U.S. Army Engineers Dist. Rock Island.

NAME	ADDRESS	ACRES AFFECTED
Beverly and Worth McCracken	R.R#1 Eddyville, Iowa	120
Donald D. Berg, P.C. MD, Ottumwa, Ia.		170
Harold Hugen	126 Geneva Drive Oskaloosa Iowa	180
Donald Francis	Box 306 Eddyville Ia	6.5
Gordon Watkins		

9,811 Acres Affected
by Des Moines river from Tracy to Ottumwa.

Copies sent to:

✓U. S. Rep. Jim Leach
✓U. S. Rep. Tom Harkin
✓U. S. Rep. Neal Smith
✓U. S. Sen. Chuck Grassley
✓U. S. Sen. Roger Jepsen
✓State Rep. Harold Van Maanen
✓State Rep. Charles Poncy
✓State Sen. Donald Gettings
✓Robert Lounsberry - Secretary Agriculture
✓John Block - Secretary Agriculture
✓Terry E. Branstad - Governor
✓Corp of Engineers - ✓Rock Island
✓Washington, D.C.

✓Conservation Comm. - ~~State~~
✓Federal

TOM HARKIN
5TH DISTRICT, IOWA

2411 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-3806

SPECIAL PHONE FOR THE
HEARING IMPAIRED
TTY-202-225-1904
VOICE-202-225-0858

COMMITTEES:
AGRICULTURE
SCIENCE AND TECHNOLOGY

Congress of the United States
House of Representatives
Washington, D.C. 20515

DISTRICT OFFICES:
1401 N. JEFFERSON
SUITE I
INDIANOLA, IOWA 50125
(515) 961-3473

BOX H
229 FEDERAL BUIL
COUNCIL BLUFFS, IOWA 51502
(712) 325-5533

245 FEDERAL BUILDING
FT. DODGE, IOWA 50501
(515) 573-7169

July 5, 1984

Lt. Col. Arthur Miller
Acting District Engineer
U.S. Army Corps of Engineers
Rock Island District
Clock Tower Building
Rock Island, Illinois 61201

Dear Col. Miller:

I would like to thank you and your staff for taking the time out of your schedules last week to meet with farmers to discuss cropland flooding problems upstream from the Red Rock Dam. My staff person, Brent Wynja, informed me that the meetings went well and that you and your staff answered a number of questions and cleared up some misunderstandings regarding the operations of the Red Rock and Saylorville Dams.

As Brent may have told you, I strongly believe that the Congress and the Corps of Engineers have an obligation to search for a solution to the frequent crop losses due to flooding in the Red Rock area. The data clearly indicates that cropland flooding has been more frequent over the past fifteen years than farmers and the Corps originally anticipated using the 45-year flood frequency estimates. I understand an extended dry spell could bring the flood frequencies back in line with the original estimates, but our farmers simply cannot wait that long nor can they afford the risk of continued flooding once every 2-4 years for the next fifteen years.

In the short run, I would ask that the Rock Island District take every action possible to minimize the potential flooding of cropland. As you know, farmers are facing very tough times financially and, therefore, we need to do all we can to help them. Anything you can do in this regard will be most appreciated.

In addition, my staff and I are also exploring options for achieving a permanent solution to this problem. I am sure our offices will be in touch as we continue to pursue this matter.

As a followup to the meetings of last week, I have listed below a series of questions that have been brought to my attention by citizens in the Red Rock area. Your responses to these questions will be most helpful.

1. In what years has the level of Red Rock Lake gone above 760 feet and what was the highest level reached for each of these years?

2. Have the flood frequency estimates for land upstream from Red Rock Dam been revised since the early 1960's when the flood easements were obtained? If so, please send me a copy of the updated estimates and also a copy of the estimates that were used in the 1960's.

3. Could more water be released from the Red Rock Lake in the winter time so that additional water storage space would be available in the spring?

4. Some landowners believe the operation of Saylorville Dam puts more water into Red Rock Lake and exacerbates the flooding of easement lands. Please explain, as briefly as possible, the impact Saylorville Lake has on the water levels in Red Rock Lake.

5. I have been told by a number of people th·+ the Corps originally predicted it would take where from six months to three years to fill R. .ock Lake, but that the lake actually filled in three days. Is this true, and if so, can you tell me why it filled so much faster than originally predicted?

6. I understand the plan of operations for the Red Rock Dam has been changed since 1969. Can you tell me when the changes were made, and what impact, if any, these changes, may have had on the flood frequency estimates? Are any additional revisions pending for the plan of operations?

7. Has the straightening of upstream tributaries along with tiling and improved drainage in the watershed area contributed to an increased flow of water into Red Rock Lake?

8. To what extent has siltation contributed to a decrease in water storage capacity at Red Rock Lake?

9. Some citizens believe the Corps does not move quickly enough to increase water flows through the Red Rock Dam during times of heavy rains and water runoff. How quickly can the Corps move to open the gates when water flows into the lake are rising?

10. Although I know this was discussed at our meeting in Carlisle, would you please list those actions the Corps will be taking or is contemplating that could help to decrease the frequency of upstream flooding?

Please send your responses to me at the following address:

Congressman Tom Harkin
1401 North Jefferson
Suite I
Indianola, Iowa 50125

Thank you for your assistance.

Sincerely yours,

Tom Harkin

Tom Harkin
Member of Congress

TH:sbw

United States Senate

WASHINGTON, D.C. 20510

(202) 224-3254

July 20, 1984

Mr. William C. Burns
Colonel, Corps of Engineers
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Burns:

I want to thank you and your staff for attending the meeting in Pleasantville on July 16. You have heard the concerns of those farmers, and I am hoping you will assist me in providing them with some alternatives. It seems to me there are three possibilities to be explored:

1. To buy out the easement land. This was done in Coralville. It would have a cost, but it would put an end to the problem once and for all.

2. To pay damages for land under water. Crop loss could be established through ASCS or FCIC yields, and farmers could be reimbursed. This would have a further advantage in that if your estimates of flooding are correct, for the long term there would be a minimal cost.

3. To make the farmers eligible for Federal Crop Insurance. I am reviewing and have held hearings to make recommendations in the federal crop insurance area. At the present time this would probably be very difficult. I will consider it when I review the entire federal crop insurance program.

In my judgment, even though they have been paid for an easement, they have suffered damages that far exceed what they were paid for. These damages were caused by the federal government and should be reimbursed by the federal government.

Thanks again to you and your staff for attending the meeting. I will be contacting the Department of the Army in Washington setting forth the same thought and ideas I have given to you. Your cooperation will be greatly appreciated.

Sincerely,

Roger W. Jepsen

Roger W. Jepsen
United States Senator
I O W A

RWJ:bg

200 E. 3rd Street, Suite 103, Davenport, Iowa 52801, (319) 322-3750 | 213 East 5th Street, Waterloo, Iowa 50703, (319) 232-1818 | Federal Building, Room 234, Council Bluffs, Iowa 51501, (712) 325-5505 | 1090 7th Avenue, Marion, Iowa 52302, (319) 377-7844 | 731 Federal Building, Des Moines, Iowa 50309, (515) 284-4574 | Badgerow Building, 4th and Jackson, Sioux City, Iowa 51101, (712) 233-3208

August 28, 1984

Army Corps of Engineers
Colonel Burns
Rock Island, Illinois 61201

Dear Colonel,

I'm writing to you to urge you to authorize the raising the level of water at Red Rock Reservoir during duck season to 734.

With the siltation problem we have, it sure would be helpful to us to facilitate enough hunting area for the hunters and ducks.

Thanks for your help.

D. Yoder

D.l. Yoder

IOWA
CONSERVATION COMMISSION

Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319
515/281-5145

An EQUAL OPPORTUNITY Agency

December 17, 1984

Colonel William C. Burns
District Engineer
U.S. Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

Thank you for soliciting comments from the Iowa Conservation Commission about the possibility of raising the normal reservoir level at Red Rock Reservoir to 730 NGVD so that 90,000 AF of conservation water storage capacity is obtained. Your proposal also includes a fall raise in reservoir level to 732 NGVD. Not much information was provided with this proposal and before submitting final comments, the Iowa Conservation Commission requests additional information.

1. In your letter of November 19, 1984, you state the proposal is to raise the normal reservoir level to 730 NGVD, but that a sedimentation study will be completed in mid-1985 and a more accurate determination of a recommended elevation needed to obtain the desired 90,000 AF can be made after completion of this study. Does this mean 730 NGVD is not the final proposed normal pool level? It would seem logical that the proposed normal pool level would be made after the sedimentation study was completed.

2. In your letter, you state that any normal pool elevation raised above 730 NGVD would have to be supported by the state. Does this mean 730 NGVD is the proposal even if the sedimentation study shows that the pool elevation needs to be higher to obtain the 90,000 AF objective?

3. Has the U.S. Army Corps of Engineers ruled out the option of fee-title acquisition of all flood easement lands? It seems obvious that the minimal raise proposed in your letter will be of short duration. One impediment to a reservoir normal pool raise of longer duration is the perceived effects on flood easement lands. Therefore, one solution is fee-title acquisition of easement lands.

4. If the normal pool elevation were raised to 730 NGVD or other possible levels, how long will the 90,000 AF storage capacity be available before sedimentation would necessitate another pool raise?

5. During the life of Red Rock Reservoir, what has been the history of water levels during September through mid-December? Staff members of the Iowa Conservation Commission do not recall high reservoir conditions during these months, but memories are not always accurate. In 1982 and 1983, we asked for fall water levels to be raised to 732 NGVD, and in 1984 we

asked that fall levels be held at 734 NGVD. Before we comment further on your proposal of 732 NGVD, we would like to be able to evaluate past fall reservoir levels.

As you are aware, the Iowa Conservation Commission felt that a normal pool level of 732 NGVD at Red Rock Reservoir would not be a problem when the U.S. Corps of Engineers was studying the reallocation of conservation storage at Red Rock and Saylorville for municipal and industrial water supplies. However, before the agency makes final comments on your proposal we would like to be able to evaluate the requested information and any other information you feel would be helpful in our deliberations.

Sincerely,

Wilson

LARRY J. WILSON, DIRECTOR
IOWA CONSERVATION COMMISSION

D1

Mrs. W. W. Klaus
R. R. No. 3, Box 379
Knoxville, Iowa 50138

2-3-85

Army Corps of Engineers
Rock Island Arsenal
Rock Island, Ill.

Corps officials -

Sorry I could not attend the Lake Red Rock public meetings that were held in our area last week, however I would like to cast my vote as favoring the raising of the Lake level. I am a strong supporter of the recreation that would be afforded to families as well as helping the economy in neighboring areas.

Sincerely
Jayne Klaus

IOWA
CONSERVATION COMMISSION

Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50[illegible]
515/281-5145

An EQUAL OPPORTUNITY Agency

February 19, 1985

Colonel William C. Burns
District Engineer
U.S. Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

In a letter dated November 19, 1984, you solicited comments from the Iowa Conservation Commission about a possibility of raising the normal reservoir level at Red Rock Reservoir. The Iowa Conservation Commission responded in a letter of December 17, 1984, requesting additional information. To date, no response has been received from our letter of December 17, 1984.

Mr. George Hardison and other members of your staff will be in our office March 1, 1985, to discuss Red Rock Reservoir water levels. We would like to have answers to the questions posed in our letter of December 17, 1984, in advance of that meeting. In addition, the Iowa Conservation Commission would like to have information concerning water level frequency and duration for various permanent pool levels. Without adequate information, the Iowa Conservation Commission cannot respond to your request concerning Red Rock Reservoir permanent pool levels.

Sincerely,

LARRY J. WILSON, DIRECTOR
IOWA CONSERVATION COMMISSION

Dl

Iowa department of water, air and waste management

February 19, 1985

Colonel William C. Burns
District Engineer
U.S. Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

This letter is sent in response to your November 16, 1984, letter regarding proposed revisions of the Red Rock Regulation Plan and associated raises in the reservoir's conservation pool.

Your letter failed to provide sufficient information on the proposed plan and pool elevation revisions to enable our department to comment on possible environmental impacts associated with such revisions. We, therefore, request that additional details on the proposed revisions be provided.

Your letter also indicated that high rates of reservoir sedimentation will make additional increases in the conservation pool elevation necessary in the future. Since this is the case, it would appear appropriate for the Corps of Engineers to prepare a long-range plan which indicates when such increases will be needed and evaluates the impacts associated with such increases. Specific impacts which should be evaluated include: changes in level of flood protection; impact on lands covered by flowage easements; and, impacts on fisheries and recreational uses.

We also recommend that the Corps of Engineers conduct additional studies to determine whether actions can be taken to reduce the rate of reservoir sedimentation. These studies should consider not only the use of structural measures (such as siltation basins or streambank erosion controls) which might be constructed on tributary streams or within the reservoir, but should also evaluate the effectiveness of implementing soil conservation measures on critically eroding areas of the reservoir's watershed.

Please contact J. Edward Brown, State Water Coordinator at (515)281-8926, if questions regarding our department's comments arise.

Sincerely,

Stephen W. Ballou

Stephen W. Ballou, Ph.D.
Executive Director

SWB:blb

henry a. wallace building • 900 east grand • des moines, iowa 50319 • 515/281-8690

Wayne Vander Leest, O.D.

Doctor of Optometry
731 Franklin Street
Pella, Iowa 50219

Telephone (515) 628-9225

Pella, IA
February 22, 1985

Col. William C. Burns
US Army Corps of Engineers
Clock Tower Building
Rock Island, IL 51204

Re: Lake Red Rock Reservoir level

Dear Col. Burns,

I am a life-long resident of Pella, Iowa. I earn my living in Pella. I am concerned about what is best for the people in this area, be it the recreational users of Lake Red Rock, or the farmers, and/or the environmentalists of the area in question.

I truly believe that the permanent level of Lake Red Rock needs to be raised. The dam was built with the prediction that pool levels would have to be increased due to sedimentation over the life span of the reservoir. It is time for the lake level to be elevated.

Reasons for increasing the Lake level are for safety of recreational users, improved habitat for wild life, but, mainly because much of the effective conservation pool volume has been lost due to sedimentation. No one wants to hurt the farmers, but Lake Red Rock need not become a victim where it is not the cause.

I urge you to support raising the permanent level at Lake Red Rock. Thank you for your time and consideration in this matter.

Sincerely,

Wayne Vander Leest

Wayne Vander Leest, O.D.

wvl/cer

The Izaak Walton League of America

DEFENDERS OF SOIL, WOODS, WATERS, AIR, AND WILDLIFE

February 28, 1985

U. S. Army Corps of Engineers
Rock Island, Illinois

Dear Sirs:

The national and local Izaak Walton League of America has fought for clean water and conservation of natural resources for 60 years. As president of the local chapter of the "Ikes" I would like to recommend raising the lake level at Red Rock to 742 feet for the following reasons:

1. Increasing the water depth allows the erroded soil to settle out further upstream thus making the water less turbid and more appealing to everyone.

2. Raising the water level leaves less exposed, non-vegetated shore line which contributes to erosion and the siltation problem.

3. Increasing the lake level from 728 feet to 742 feet would only reduce the reserve capacity of the lake 12%.

4. The proposed 14 feet increase would provide more quality habitat for water fowl.

5. With less turbid water comes better fishing habitat.

The "conservation community" is concerned about two problems which have plagued Lake Red Rock from the beginning: siltation and shoreline erosion. We feel raising the lake level will reduce these problems significantly.

Best Regards,

B. HAGEMEYER

Bruce Hagemeyer
Rt. 1, Box 62
Pella, Ia. 50219

REALTOR·

MARION COUNTY BOARD OF REALTORS

1409 W. Jackson
Knoxville, Iowa 50138

March 7,1985

Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building - P.O.Box 2004
Rock Island, Illinois 61204-2004

CORPS OF ENGINEERS:

The Marion County Board of Realtors would like to express their support of your plan to raise the level of the permanent pool at Lake Red Rock. It is our belief that raising the pool level will permit maximum usage of the lake and, hopefully, economic benefit for this very depressed area. It will permit a constant outflow during the dry season and increase the potential for development of hydro-electric power.

However, we do have concerns regarding two things:

1. If the flooding of easment land and leased land will be more frequent than the original intent, land owners and renters should be fairly compensated.

2. The debris (dead trees, etc.) in the lake be removed prior to raising of the lake.

The Marion County Board of Realtors is an organization of seventy Realtors in Knoxville, Pella and Pleasantville and we commend you on your foresight concerning the future of Lake Red Rock.

Sincerely,
MARION COUNTY BOARD OF REALTORS

Clark Realtors Don Clark	Johnston Real Estate Bill Peters
Galvin Realty C.R. Galvin	Peters Realty Paul K. Sherwood
Hansen Real Estate C Hansen	Sherwood Real Estate Mary Stotts
1 First of Knoxville Richard D Bailey	Stotts Realty Eileen Capie
1 First of Pella Gladys L. Nieuwsma	Sutherland Real Est

Lake Red Rock Marina

Route 1, Pella, Iowa 50219 515-627-5743

Col. William Burns March 9, 1985
Rock Island Corps of Engineers
Department of the Army
Rock Island District Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Re: Red Rock Dam and Red Rock Lake
Lake Red Rock Marina
Lease Contract # DACW25-73-193

Dear Colonel Burns,

We, at Lake Red Rock Marina, want to ask for an interim lake-level rise this season. We are finding that the erosion and silting resulting from the last two seasons of flooding have closed the public ramp to one lane at 728 with a dumping of mud at its base so as to make launching unsure and unsafe. The effect is pretty much the same in the narrow channel between our gas dock and the shore. That channel is the access to most of our slips on the west side of the dock.

We will be taking soundings this weekend now that the ice is out so that we can send you an accurate assesment of the depth in the bay needed for safe boat launch, passage and storage. We have a great concern that we will have to turn away some of our present customers if the lake level is not raised above 728 this season.

Tragically this problem comes at a time when boaters from Saylorville are looking to Red Rock and finding it not so far away after all and twice the size! It comes at a time when we have sent a proposal to R. A. Mattson of Real Estate for the addition of 16 slips and have engaged an engineering firm to do a feasibility study for a new road to access the dock. ~~The~~ The feasibility study was suggested by Mr. Willis Tait, Corps Real Estate office, 1/30/84. Last season's high water drew our focus away from roads.

We did not cry "Help" with such urgency earlier because we were counting on a lake rise sooner then the 18-months we were told it would take when we met with your staff at the Red Rock Corps Headquarters. Our reference and confidence was in a letter sent to Neal Smith and a copy to us from Lt. Col. Arthur Miller on May 29, 1984. He wrote to Congressman Smith:

> "......are in the process of completing a study to determine the new permanent pool level of Lake Red Rock. This study is scheduled to be completed on or before the end of the current fiscal year, and indications are that we will have a new higher pool

level, We are currently looking at various elevations, but all of them will be higher than the current pool level and will provide an increased depth in the marina bay. I trust this information adequately addresses your concerns........"

Beyond the fact that an expansion would be unwise without a rise in the lake level, our present docks will soon be unusable and unsafe if the present pool level remains the same. It is essential to the continued existence of a marina at Red Rock that the lake level be increased.

We look forward to meeting you personally at the public meetings to be held in Ottumwa and Knoxville on March 26 and 27. We would like to discuss these matters with you. We invite you to visit Lake Red Rock Marina during your time in the area.

Sincerely,

Ruth S. Hoover

Ruth S. Hoover

United States Department of Agriculture

Soil Conservation Service

104 South Sixth
Knoxville, IA 50138

March 11, 1985

Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204

Dear Sirs:

I would like to receive a copy of the "Alternatives to the Regulation of Lake Red Rock" report. The Marion County Soil Conservation District is concerned with how the proposed raising of the lake will effect past and future soil conservation practices.

Paul A. Flynn
District Conservationist

PAF/fvh

Floyd Hammer
Second and Davis Street
Union, IA 50258

Col. William C. Burns
US Army Corps of Engineers
Clock Tower Building
Rock Island, IL 61204

Subject: Lake Red Rock

Dear Col. William C. Burns:

I am writing to ask you for your support at the up coming public workshops concerning Lake Red Rocks' Pool Elevations.

We regularly utilize the lake facilities for recreational purposes. We utilize the marina for our sail boat. Sedimentation last year rendered a significant portion at the west end of the lake unusable. We understand the pool elevation could be raised to 742 feet NGVD. We would ask for your support and recommendation to raise the lake to that level. I am not an engineer, but common sense tells me that this would shift future sedimentation further upstream while making the lake far more useful for recreational purposes.

Because of problems at Saylorville marina we anticipate far greater utilization of Lake Red Rock facilities. The 742 foot elevation would allow Red Rock marina to expand its facilities to accommodate the additional lake utilization which will surely materialize during the "turmoil" at Saylorville.

Please give your consideration and support to our request.

Respectfully,

Floyd Hammer

Floyd Hammer

3-12-85

Dear Mr. Burns,

We are concerned citizens on the level of Lake Red Rock. We live right on the lake and use it alot (4-5 times a week) for recreational boating activities which includes alot of skiing. We would very definitely like to see the permament pool level raised to keep the lake such that people such as us can enjoy and use it during the summer. We don't want to hurt Iowa's farmers but we feel that by raising the permament pool level it will not substantially effect the flooding problem.

Sincerely,

Phil + Jan Stanley
R.R. 3 Box 232
Knoxville, IA 50138

Lake Red Rock Marina

Route 1, Pella, Iowa 50219 515-627-5743

March 13, 1985

Col William Burns
Rock Island District Corps of Engineers
Department of the Army
Clock Tower Building
Rock Island, Illinois 61201

Re: Red Rock Dam and Red Rock Lake
Lake Red Rock Marina
Lease Contract # DACW 25-73-193

Dear Colonel Burns,

In a letter dated March 9, we of Lake Red Rock Marina, expressed a need for an interim lake level rise since we were told that an environmental impact study would have to be made before a new permanent pool level was set for lake which would not be before September of '86.

To substantiate the request we made, I am inclosing the soundings which were made last weekend with a lake level of 730.7. The measurements were taken at the Wallashuck ramp on the marina (west) side channel and between the gas dock and the west shoreline.

The back of the yellow brochure has a layout of the marina, hilltop and dock. The layout was replaced this year with a map because it was more confusing than useful. However, for our purposes of locating where we took the soundings, I hope that it will be useful. The location is marked in colored ink.

We have lowered the price on the slips on that west side of the dock because people find them so difficult to get into. They are now $500 rather than $600. They are the slips which we may not be able to lease at all if the lake level is not above 728 for the season. The figures from the soundings were made with the lake at 730.7.

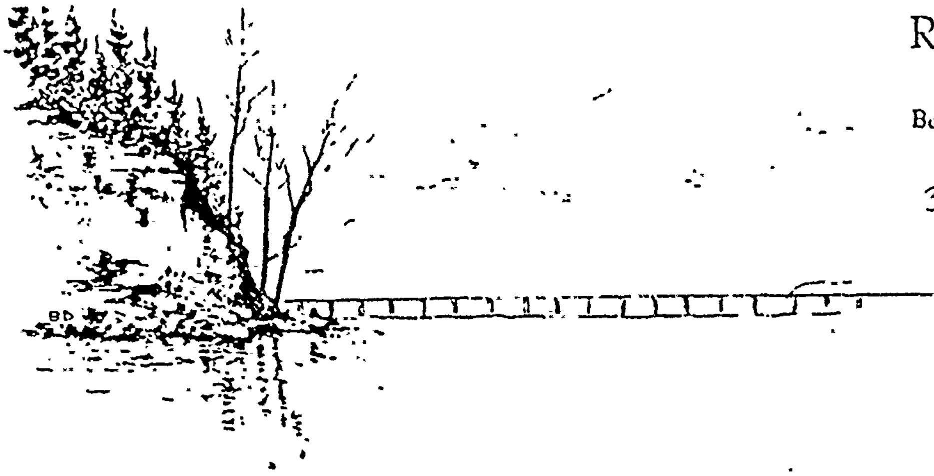
As we conclude on the information sheet, we feel that an interim level of 736 would give us the safest passage in that area.

We would invite you to visit the marina when you are here for the lake-level public meetings. We would be happy to show you the area about which we are concerned.

We are, as the previous letter indicated, desiring to put in new dock slips and an access road to accomodate the demand for more storage space. We would appreciate hearing from you on this matter at your earliest convenience.

Sincerely,

Ruth S. Hoover



RED ROCK LAKE ASSN.

Box 145 Pella, Iowa 50219

3-13-92

The Red Rock Lake Association is completely supportive of the proposed increase in the level of Red Rock Reservoir to 742 feet NGVD.

Universal siltation of the Lake is creating disaster areas for recreationists.

It would appear that the need to raise the permanent pool is a compelling one and should be accomplished immediately. Since no earthwork was accomplished prior to the filling of the Lake in 1969 there are now areas where siltation has made safe boating a major hazard. Wallaschuck Bay is a prime example of this.

Several boat ramps have been lost to useage because of erosion and siltation:

Whitebreast Heights

Lakeview

Wallingslock (Fifield)

Loss of shoreline due to high water levels for three of the past 15 seasons has contributed to erosion and siltation on major portions of the South side of the lake.

As concerned citizens of Marion County and as a Lake Association we recognize there are disadvantages as well as advantages to the proposed increase in water level.

Some advantages:

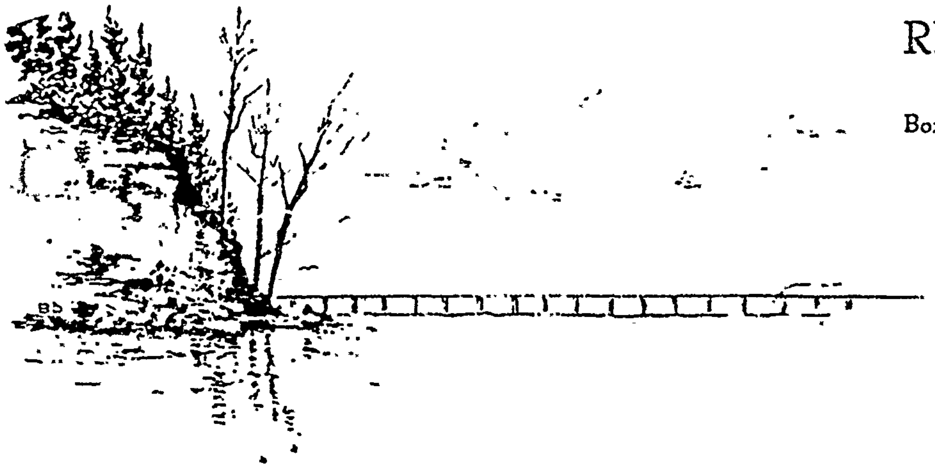
Double safe boating area

Insure safe depths in Wallaschuck Bay where the only North shore ramp usable at all lake levels is located.

Improve appearance of Red Rock Lake from the Highway 14 bridge where the siltation is most evident.

Create clearer water for recreational activities, namely fishing and swimming.

A VOLUNTARY ASSOCIATION OF BUSINESSES AND INDIVIDUALS TO AID DEVELOPMENT OF THE RED ROCK AREA FOR WILDLIFE, FLOOD CONTROL, CAMPING, & WATER SPORTS.



RED ROCK LAKE ASSN.

Box 145 Pella, Iowa 50219

Create additional backwater areas for fishing and boating.

Some disadvantages:

Possible increase in flood potential above and below the dam.

Possible negative impact on farmers above the Reservoir.

Possible relocation of State Conservation Wild Life Preserve.

Cities and counties downstream of the dam are benefitting substantially with increased land values and savings in flood losses since the creation of Red Rock Dam and Lake.(D.M. Register Feb. 3.,1985).

Marion County, on the other hand, is sustaining tax losses in the half-million dollar bracket annually because of land removed from the tax records.

We, as an Association, feel that since Marion County's major benefit should be recreation and tourism, it is up to the creators of the Lake and Dam to seek with us ways of upgrading the present situation at Lake Red Rock so that revenues can be returned to the citizens of Marion County.

Together we have made many accomplishments already. The Corps of Engineers has made substantial progress since 1974. These are commendable but have come only through constant encouragement on the part of concerned members of the Lake Association and local citizens.

Roads have been paved, beaches created, campgrounds electrified and beautified 2 useable ramps completed and a systematic reforestation program begun. As an Association we wish to commend Chuck Kennedy, Park Manager and his fine staff for creatively improving that which the Rock Island District bestowed on Marion County.

Now we would like to discuss what the future management plan is for Red Rock Lake. How can we have some in-put into future planning and development? Is it unrealistic to expect to see businesses profit and expand in the area?

March 13, 1985

United States Engineer District
Rock Island
Clock Tower Bldg.
P.O. Box 2004
Rock Island, ILL
61204-2004

Re: Raising of permanent pool; Red Rock Dam

To Whom It May Concern:

It is the opinion of the Marion County Civil Defense office, that steps should be taken by the Corps of Engineers to correct the wrong-doing of the repeated flooding of easement ground without making proper adjustments to the property owners.

The raising of the permanent pool will only increase the flood potential and leave these people with ground absolutely useless for farming and abused far beyond what original estimates stated, making the idea of easements something that hardly falls into the ideals of our government.

I am sure the Corps of Engineers will take these matters into consideration before raising any levels of the dam above their own property at any time.

Sincerely,

John Mc Coy
Marion County Civil Defense Co-ordinator
Marion County Zoning Administrator

JM/bs

cc: Senator Charles Grassley
Senator Tom Harkin
Rep. Jim Ross Lightfoot
Rep. Neal Smith

MARION COUNTY BOARD OF SUPERVISORS
COURT HOUSE
KNOXVILLE, IOWA 50138
828-2231

March 13, 1985

TO WHOM IT MAY CONCERN:

It has been brought to the attention of the Marion County Board of Supervisors that the U.S. Army Corps of Engineers will be holding a meeting on March 27, 1985 at 1:00 p.m. at the National Guard Armory in Knoxville. The purpose of this hearing is to discuss the impact of the raising of the permanent pool in the Red Rock Dam.

It is the feeling of the Marion County Board of Supervisors that if this is the case and the minimum level of the pool must be raised, that action be taken to correct the problems created for land owners of which the government has only easements with. That these property owners are justly dealt with so as not to be flooded out again without just compensation, or the complete buying out of their property which is under easement.

The Marion County Board of Supervisors feel that it is only after such steps have been taken that any reasonable raising of the permanent pool could be warranted.

Sincerely,

Harold De Zwartz

Harold De Zwartz, Chairman
Marion County Board of Supervisors

Dick Dunkin

Dick Dunkin, Member

F Peak

Frank Peak, Member

MCBS/dc

Enclosure
cc: Senator Charles Grassley
Senator Tom Harkin
Rep. Jim Ross Lightfoot
Rep. Neal Smith

KNOXVILLE CHAMBER OF COMMERCE

305 S. THIRD, P.O. BOX 337 KNOXVILLE, IOWA 50138 515-828-[illegible]55

March 15, 1985

U.S. Army Corps of Engineers
Attn: NCR-PD-R
Clock Tower Building
Rock Island, Illinois 61201

Dear Gentlemen:

The Board of Directors of the Knoxville Chamber of Commerce has reviewed your request for comments on Alternatives to the Regulation of Lake Red Rock, and would like to go on record as favoring an increase in the lake level to 742 feet (NGVD) as put forth in alternative number two. We feel that this approach is most advantageous from a recreation and aesthetic standpoint, and would have less impact than raising the level to this ultimate stage in a number of steps.

In taking this position, we have accepted your assertion that changes in the lake level will not significantly impact either flooding of easement land or erosion of the downstream corridor.

None-the-less, we do have strong concerns about the landowners/renters who are trying to farm ground on which the corps has easements. It is our understanding that these landowners were given a one-time payment for these easements based on a projected flooding frequency. Most of these individuals have been unable to get a crop from this ground for three of the last five years. This is far in excess of the flooding frequency on which the payment was based. In light of this fact, we feel that new negotiations with these landowners are very much in order.

We also feel that before any change in the lake level is made, the flood plain should be cleaned of debris that would detract from the appearance of the area, or tend to deposit in areas that would require cleanup at the landowner's expense. We feel that this topic should be part of the Environmental Impact Statement.

In closing, we would like to commend the Corps of Engineers for their far-sightedness in planning for the management of Lake Red Rock, and thank you for the opportunity to express our opinion.

Sincerely,
KNOXVILLE CHAMBER OF COMMERCE

Chris Hoegh

Chris Hoegh
President

WEARING APPAREL • SHOES • DRY GOODS • PHOTOGRAPHY

T & D DEPARTMENT STORE

626 FRANKLIN STREET • PELLA, IOWA 50219

March 18, 1985

U.S. Army Corps of Engineers, Rock Island
Attn. NCR-PD-R
Clock Tower Building
Rock Island, Ill. 61204

Gentlemen:

In response to your information concerning the alternative to the regulation of Laake Red Rock, I would like to make the following comments.

I live in Pella and rent mooring space from Lake Red Rock Marina for a twenty six foot sailboat. I use the marina ramp only twice yearly (in and out). Other than parking we do not avail ourselves of services in the area.

I am in complete agreement with the an increase in permanent pool level. An increase of at least five feet is imperative before summer '85. The "Corps" is probably in a better position to judge the time span for further increases in pool level.

Something that has caused me a great deal of concern is the lack of facilities at the R.R. Marina ranp a rea. Thousands of boaters use this ramp every summer. The marina ramp is a popular one and is probably the most used ramp on the lake. It has no supporting facilities. We have seen millions of dollars poured into recreation areas on the lake as well as the tailwater area. Some of these areas seem to have a rather low occupancy rate . The following are some suggestions for a more favorable recreation area in the vicinity of Red Rock Marina ramp.

1. Keep ramp clear of debris and mud.
2. Install courtesy dock able to accomodate changes in water level.
3. Install restrooms and possiblly shower facilities.
4. Provide a picnic area with shelter and tables
5. Repair cul de sac road to improve traffic flow.
6. Improve aesthetics with landscaping and planting.

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These service are certainly needed to accomodate the many people who use this area. I see a particular need for families who travel some distance to use the lake and are possibly spending the entire day in tha area.

Thank you for asking for suggestions from interested parties. These suggestions are given in the interest of making Lake Red Rock a more enjoyable recreat;ion area for everyone.

Sincerely,

A. De Wild

Al De Wild

United States Department of the Interior
BUREAU OF MINES
P. O. BOX 25086
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225
Intermountain Field Operations Center

March 20, 1985

Colonel William C. Burns
District Engineer, Rock Island District
U.S. Army Corps of Engineers
Attention: Planning Division NCRPD-P
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

Personnel of the Intermountain Field Operations Center, Bureau of Mines, have reviewed the document on Alternatives to the Regulation of Lake Red Rock, Des Moines River, Iowa. The document discusses methods of raising the level of the authorized conservation pool from 728 to 742 feet National Geodetic Vertical Datum (NGVD) in order to compensate for the loss in water storage capacity caused by sedimentation. Our primary concern is potential impacts to mineral resources.

The document mentions mineral resources (p. 17) and states that there would be no impacts on mineral resources. We have no objection to the document as written.

Sincerely yours,

Jim Jinks

for W. William Cochran, Chief
Intermountain Field Operations Center

3-22-85

Dear Col. Burns,

We would very much like to see Lake Red Rock raised to 742 feet above sea level. The siltation problem ~~around~~ under the High-Way 14 bridge is dangerous and unsightly. Anything you could do to make this raise in one move would be greatly appreciated.

Thank you for your consideration.

Dr. & Mrs. Robert A. Blair
112 S 1st St.
Knoxville, Ia. 50138

RED ROCK YACHT CLUB

March 23rd, 1985

U.S. Army Corps of Engineers Rock Island
Attn: NCR-PD-R, William C. Burns, Colonel
Clock Tower Building
Rock Island, Illinois 61204-2004

Dear Colonel Burns:

As frequent recreational users of Lake Red Rock, we the members of Red Rock Yacht Club are most interested in your recent study of Alternatives to the Regulation of Lake Red Rock.

As our club approaches its tenth anniversary with a membership of nearly eighty families, we can be very sympathetic with the Corps and the problems that have been encountered in the management of Red Rock over the years. We have seen first-hand the sinking of sand island and the growth of the mudflats mentioned in your report. Our members with fixed-keel sailing craft find that the size of their sailing area has shrunk. We have seen the banks at the marina, and even a once-useful roadway, slip into the lake. And we have seen the Corps of Engineers, charged with lake and dam management, unable to react because of political, budgetary, and priority considerations. If the March 84 report is at all accurate, it is obvious that some things must change — and soon.

We all realize that Lake Red Rock would not exist had it been proposed solely for recreational purposes. In fact, we even agree that at the point that recreational uses would become incompatible with the flood control and water supply requirements of the project, the recreational aspects would have to be abandoned. If it is decided that flood control and adequate water supplies along the Des Moines River Basin require a huge mudflat in Marion County, we will pack up our boats and go home. However, your report seems to indicate that a larger permanent pool at the present time would not only enhance all three of these purposes immediately, but would even prolong the life of Red Rock.

We consider farmers who live and work around Lake Red Rock our friends and neighbors. Although we feel that some may be a little short-sighted in wanting to retain lower water levels, we do believe that the occurance of high water for the past three years running coupled with the proposed raising of the water level should result in the renegotiation of lease payments or the outright purchase of additional land. Using

the Corps' own figure that the Red Rock project has prevented over $84 million in damage during its operation, it would seem that sufficient funds should be available to satisfy those few individuals who are still being hurt by the project.

As users of Lake Red Rock, we have one major concern: Will the introduction of the March 85 report actually delay any raise in the lake level due to the process necessary to select an alternative and to prepare the associated Environmental Impact Statement modifications? The report properly notes the improvement to recreational use of the lake at increased water levels. But it does not adequately emphasize the deterioration of recreational useability that has already occured. A boat with a four-foot draft (not uncommon on Lake Red Rock) can still navigate the lake but with increasingly frequent unexpected groundings. To operate such a craft on Red Rock at normal pool without the use of a depth sounder is now a foolish thing to do. One particularly bad is area is the channel leading to the marina. One would think that the Corps would have some responsibilities to its tenant at the marina to keep at least that waterway open.

If Lake Red Rock is to continue as a boating location, either the water level must be raised to 732 feet or the marina channel must be dredged. **We understand that the lake could be raised to this level immediately under the current plan regardless of any change resulting from the March 85 report and without any modification to the Environmental Impact Statement.**

Strange as it may seem, we also have some concerns regarding the possibility that the permanent pool be raised to 742 feet. As boaters, we would quite naturally appreciate the larger lake. But before the level is raised, we would strongly recommend that a breakwater, possibly a sea wall with provision for dockage and fishing, be constructed to protect the marina area from waves coming from the main lake. We would also strongly urge that the embankments along the marina channel, which are already eroded to the extent that a roadway has disappeared, be protected. We know the record for after-the-fact maintenance and we don't want to get a larger lake at the expense of a safe harbor and one of the finest marinas in the state.

You should know that some effort has been made over the last several years toward establishing the entire Des Moines River Basin from Saylorville Lake to Lake Red Rock as a National Park. We look forward to the day when that is a reality and dream of the day we will be able to boat through the park all the way to Des Moines. We would like our dream to last for our

children and for our children's children — much longer than 100 years. It would be more than a shame; it would be a crime against future generations if Lake Red Rock were permitted to become the mudflat at the end of that dream.

The final draft of this letter has been approved by the officers and directors of Red Rock Yacht Club.

Respectfully yours,

L L Quayle

Larry Quayle, Commodore
Red Rock Yacht Club
133 Emerson Hough Drive
Newton, Iowa 50208

cc: Honorable Charles E. Grassley, United States Senator
Washington, DC 20510

Honorable Tom Harkin, United States Senator
Washington, DC 20510

Honorable James A. S. Leach, Representative in Congress
Washington, DC 20515

Honorable Jim Ross Lightfoot, Representative in Congress
Washington, DC 20515

Honorable Neal Smith, Representative in Congress
Washington, DC 20515

Governor Terry E. Branstad, State Capitol
Des Moines, Iowa 50319

Larry Wilson, Director Iowa Conservation Commission
Wallace State Office Building, Des Moines, Iowa 50319

LORENZ AND JONES
MARINE DISTRIBUTORS, INC.
P.O. Box 882 Des Moines, Iowa 50304
Office and Warehouse located
1920 Delaware Ave., Ankeny, Iowa 50021
TELEPHONE 515-964-4205

March 25, 1985

Colonel Burns
U.S. Army Engineer District
Rock Island
Clock Tower Building
Rock Island, IL 61201

Dear Sir,

I am writing to you in regard to a report I heard recently that the Corps of Engineers is considering raising the level of Lake Red Rock 14 feet. I was very glad to hear that and would like to show some support for the idea.

I live in Des Moines, but have been boating and camping at Red Rock since before Saylorville Lake was filled. Saylorville was great for awhile as it is so close to home for me personally, and because it has helped the wholesale marine distributorship by which I am employed in Ankeny.

The central Iowa boating industry has been and will continue growing and expanding. However, due to this market increase, Saylorville Lake has become dangerously overcrowded during the summer months. Many people who use this lake hardly know Red Rock exists; and other people who have never been there think it is just a shallow, polluted hole. While it is shallow at 728 feet, the water quality and facilities on and around the lake are as good as any reservoir in the state.

I realize this increase would probably have to be gradual. A rise of several feet this year and the rest next year would make Red Rock the largest; and in my opinion the finest lake in Iowa.

There are many scenic places on Lake Red Rock that are not now accessible by boat. I will continue to use Red Rock regardless; but the water level to 742 feet and a little publicity, much pressure would be taken off Saylorville Lake bringing the weekend crowds down to a more manageable level. Raising the water level of Red Rock would boost the boating business and economy in central Iowa by providing more room for the industry to grow and expand.

Thank you for taking into consideration my point of view. I hope it will get favorable results.

Sincerely

Gary Brandenburg

Gary Brandenburg
Lorenz & Jones Marine Distributor, Inc.

cc: Congressman Neal Smith
Jim Lightfoot
Senator: Charles E. Grassley
Tom Harkin

Centrally Located - Serving the Midwest

US Army Corps of Engineers
Attn: NCR-PD-R
Clock Tower Building
Rock Island, Ill. 61204-2004

March 26, 1985

Re: Comments to "Alternavie to the regulation of Lake Red Rock."

Attached you will find my comments to the proposed regualtion of Lake Red Rock (see pages 2 of 3 and 3 of 3).

Thank you,

John E. Stuart

John E. Stuart
1631 Greenwood Dr.
Ottumwa, Iowa 52501

I have read with interest your report on the "Alternatives to The Regualticn of Lake Red Rock". I say interest as it appears that there are really no alternatives to the regulation, you have already stated that the pool will be raised. You simply can't decide wheather to do it all at once or a little at a time, and that translates to alternatives in implementation not regulation.

Even in light of this fact, I am caused to ask the following questions and make the following observations.

1. How does Lake Red Rock suppliment the low flow releases of Sailorville Lake? Are you saying that by holding back more water at Red Rock that the river level up stream from Red Rock will be maintained at a higher level? If so what is the purpose for this?

2. How much of the conservation pool has been lost to sediment? (please give a percentage of the original total)

3. How does this loss compare to the projected loss? If it is lower how much lower is it, if it is higher how much higner is it?

4. You state that the increase in pool level and release rates will "have no significant effect on down stream erosion". What data do you have to support your contention?

5. What effect will increased pool level and extended periods of flooding have on down stream areas?

6. You say that maximum crop season release rates will be raised from a maximum of 18,000 CFS to 22,000 CFS, when the pool level exceeds 760 NGVD.
   a. How often in the last five years has the 760 level been exceeded?
   b. What effect will this have on down stream flooding and erosion?

c. What effect will the non-crop season release rate of 33,000 cfs have on down stream flooding and erosion?

d. Is this, the 33,000 cfs an increase, decrease or status quo release for non-crop season release.

7. What effect does a saturated stream bank have on erosion?

8. Since you list no real alternatives to the regulation of Lake Red Rock, what consideration, if any, have you given to the following?

a. Lowering the standing pool level. which would essentially allow for gratere peak season run-off stroage capacity.

b. Removing accumulated sediment? Has there been a weighing of the costs of renovation vs. the costs of increased siltation and down stream damage?

c. What studies and or steps have been taken to releive the sedimentation build-up?

d. What is the relation to renovation as compared to the cost of down stream damage and loss of stroage capacity?

While I will conceede that I have approached the issue in an agrumentative manner, I feel little recourse and the information was presented in a manner that left little room for a different approach.

Sincerely,

John E. Stuart

John E. Stuart

Iowa Participating Counties: DAVIS
JEFFERSON
KEOKUK
MAHASKA
VAN BUREN
WAPELLO

The Pathfinders RC&D

50 EAST WASHINGTON AVENUE FAIRFIELD, IOWA 52556 515-472-6177

March 26, 1985

Mr. George Wells
Planning Division
Plan Formulation Branch
U.S. Army Corps of Engineers
Rock Island District

Dear Mr. Wells:

The report by the Corps of Engineers entitled Alternatives to the Regulation of Lake Red Rock, dated March, 1985 has been reviewed by the Wapello County Resource Conservation and Development (R.C. & D.) Committee.

In response to this report, we propose the following:

1. Maintain the permanent pool at elevation 728 to provide for low flow augmentation during periods of drouth. This may mean a reduction in the available water-based recreational activities. This should be more acceptable than raising the permanent pool.

2. Consider methods of reducing or controlling sediment before it enters Lake Red Rock. The Corps could promote soil conservation within the drainage area, assist in upstream streambank erosion control, and study methods of sediment entrapment prior to entering Lake Red Rock.

3. Work with downstream landowners in controlling streambank erosion. Investigate new techniques that may be available, particularly the Iowa Vanes concept that is being initiated on the Nishnabotna River by the Iowa DOT. The Report indicates that no change in the rate of erosion has been associated with the operation of Red Rock Dam. Based on landowners and committee members observations, we contend that the longer duration of bank full flow has aggravated and increased the bank erosion problem.

Sincerely,

Ed Klodt

Ed Klodt, Chairman
Wapello County R.C. & D.
1309 East Mary Street
Ottumwa, Iowa 52501

EWK:ro

THE PATHFINDERS RESOURCE CONSERVATION AND DEVELOPMENT AREA

JOHNSON, BAUERLE, HESTER & WALTER
ATTORNEYS AT LAW
P. O. BOX 716
OTTUMWA, IOWA 52501

WALTER F. JOHNSON
RICHARD C. BAUERLE
DAVID J. HESTER
THOMAS M. WALTER

111 W. SECOND ST.
AREA CODE 515
TELEPHONE 684-5481

March 26, 1985

U.S. Army Corps of Engineers
Rock Island District
Rock Island, Illinois 61201

Re: Change in pool level at Red Rock Reservoir

Dear Sirs,

We are particularly concerned about two areas:

1. Hydro-Electric Power Production Capability

   (a) Higher levels - higher flows for longer periods of time would tend to decrease production capability.

   (b) Periods of time when water would be captured and stored to reach these higher levels would reduce existing stream flows and result in lower levels of power production.

   (c) The consideration of our input by the Corps of Engineers and whether the Corps has the flexibility to protect and maintain our existing average annual production.

   (d) Whether the Corps, in consideration of our input, has the flexibility to enhance power production capabilities.

   (e) Whether we would be assessed for any increased benefit as a result of any enhancement of power generation capability.

   (f) A study in 1980 conducted by the FERC of select annual periods during the 70's showed we had a net loss in power production capability as a result of Red Rocks construction and operation.

   (g) Has the Corps of Engineers given consideration to any economic loss we may suffer?

(h) What operational changes might this change require in our dams operation procedures?

2. Water Supply

(a) Will this proposed raise in pool level change the intended use of Red Rock Resevoir from flood control to water supply storage?

(b) If the use does change to water supply storage will downstream State permitted municipal water supply users be assessed for water supply storage?

(c) Will this change in pool level at Red Rock result in any change in minimum allowable stream flow of 300 CFS?

(d) Is the current minimum streamflow of 300 CFS now available 100% of the time and if not what percentage of this additional storage would be assessed to permitted users?

(e) Previous stuies of proposed pool changes at Red Rock have indicated a cost to the Ottumwa Water Works for a water supply consumption of 15 CFS of $130,000 a year for the initial year and approximately $110,000 a year for each subsequent year. What are the current assessments, if any, proposed as a result of this pool level change?

(f) If there are assessments to water supply users for purchase of storage space or water suply as a result of this proposed pool level change, will offsetting credits be given for water impoundments that provide users own reserves, ie: 1) water supply storage, the lagoon system, 2) water impoundments of other surface water supplies and partially treated water storage in quarries, 3) pools behind Hydro-Electric dams; our pool capacity is just under 2,000 acre feet? Will offsetting credits be allowed for possible loss in power generation capabilities and credited against water supply assessments proportionately?

(g) The siltation in Red Rock is currently the cause or reason for this proposed pool level change. The silt contains high concentrations of herbicides and pesticides. What consideration will be given water quality for example: although the water may be available in quantity during periods which it may otherwise not be available as result of this pool change, the water might very well be unusable from a quality stand point with respect to Federal Drinking Water Standards and the clean water act.

(h) What offsetting credits will be allowed Muncipal permitted water supply users for municipal waste water discharges as offsetting credits for quantities of water withdrawn from the stream and subsequent assessments, if any?

(i) What actions have been taken by the Federal Governments respective agencies to require purchase of water supply storage by new users over the past three to five years to offset theoretical shorages, ie: Chillicothe Power Plant, Cargill, Anjiamoto, Eddyville, Des Moines and others?

(j) What actions have the Corps taken to protect the stream from discharges which would tend to degrade water quality, i.e. N.P.D.E.S. discharge permit and waivers, Des Moines Waste Water Plant, Iowa Power Plant, I.S.U. Chillicothe Power Plant, Cargill, Anjiamoto, Eddyville, Milwaukee Railroad and others?

(k) In the Corps view will the State administer the allocation and assessments if any for the planned change in pool level?

(l) Are current copies of the Corps' continuing water quality studies of Des Moines river water quality which were conducted by Dr. Bauman of the Iowa State Water Research Laboratory in Ames, Iowa, available for our review and why were they not forwarded on a routine basis and at least annually as requested?

(m) What consideration and planning has been given to correcting the existing high nitrate pollution problem caused by high agricultural run-off and municpal and industrial waste discharges?

(n) What will be the effect of these rising nitrate levels that are lasting for longer durations of time on downstream water users during periods of low steam flow as a result of the proposed pool level change?

(o) If assessments are made for enhanced supply, has assessment provision been considered for degradation through discharge?

(p) To what extent in the planned pool raise will the State of Iowa Department of Air, Water, Waste Management and the Corps of Engineers coordinate facilitation of this project to avoid the problems of the past in having to deal with two separate governmental entities and their respective departments. It has been near impossible to separately assess the impact of such a project. Therefore I recommend a joint environmental impact evaluation and consideration of joint coordination of the project by the Corps and the State.

Please add my name to your mailing list and provide a copy of your draft and final updated report referred to in the syllabus of "Alternatives to the Regulation of Lake Red Rock."

Please also provide copies of "Water Quality Studies - Red Rock and Saylorville Reservoirs Des Moines River, Iowa" for 1984 and 1985.

Sincerely yours,

Thomas M. Walter, Board Attorney
Ottumwa Water Works & Hydro Electric Plant

st

Cooperative Extension Service

Iowa State University of Science and Technology

WAPELLO COUNTY

229 E SECOND
OTTUMWA, IOWA 52501
515-682-9892

March 26, 1985

U.S. Army Corps of Engineers Rock Island
Attn: NCR-PD-R
Clock Tower Building
Rock Island, IL 61204-2004

Dear Sirs:

The Wapello County Agriculture Extension Council at its regular meeting on March 25, 1985, passed a resolution requesting that the Army Corps of Engineers leave the conservation pool at its current level of 728 feet NGVD. The following reasons being cited:

1. Stream bank erosion will be more severe and is already very serious.

2. Flooding will increase along the stretch of river below the dam, when heavy rains occur in the watershed below the dam, if the outflow at Red Rock is at 22,000 CFS or greater.

3. The increased number of days when the river below the dam is at or above 22,000 CFS will cause the water table to raise enough to make an estimated additional 3,500 acres or more in Wapello County non-productive or at best delay planting past critical time of June 15.

4. Recreational needs are not as great as what was projected in planning stage of Red Rock Lake because population of Iowa has not increased at the projected rate and in fact is declining.

5. Land owners with easements in the flood control area above the dam will be adversly affected.

6. The Red Rock Lake should have as its primary purpose flood control with recreation and water supply as secondary by products. Increasing the conservation pool to 742 feet will decrease the flood storage capacity by 17% and would have been very significant factors in 1973, 1982 and 1984.

If the conservation pool cannot be maintained at 728 feet NGVD alternative #1 is the only one of the four that should be considered.

Sincerely,

Terry Willhoit

Terry Willhoit
President Wapello County Agricultural Extension Council

TW/dc

United States Department of Agriculture

Soil Conservation Service

1309 E. Mary
Ottumwa, Iowa

March 26, 1985

Mr. George Wells
Planning Division
Plan Formulation Branch
U.S. Army Corps of Engineers
Rock Island District

Dear Mr. Wells:

It has been my observation along with those of numerous landowners that streambank erosion on the Des Moines River in Wapello County is a very serious problem that is aggravated by the increased duration of bank full flows from Red Rock Lake.

This condition has also been aggravated by landowners who have ~~initiated~~ intensified cultivation in the flood plain and removed trees and brush adjacent to the river, that did provide some degree of stabilization.

I would encourage the Corps to:

1. Provide technical assistance and if possible financial assistance to downstream landowners to control streambank erosion.

2. Construct control measures where bank erosion is threatening roads.

3. Investigate new methods of control such as the Iowa Vanes and if feasible, initiate a pilot project downstream from Red Rock Lake.

4. Consider obtaining easements along the streambank where critical erosion is occurring and plant a buffer zone of trees between the river and cultivated fields.

Whatever decision is made as to permanent elevations for the Red Rock Pool, the streambank erosion problem will persist and will need to be addressed.

Sincerely,

Wm. R. Woerner

Wm. R. Woerner
District Conservationist

WRW:ro

IOWA FARM BUREAU FEDERATION
5400 University Avenue, West Des Moines, Iowa 50265 / (515) 225-5400

March 27, 1985

Department of the Army
U.S. Corps of Engineers
Rock Island
Attention: NCR-PD-R
Clock Tower Building
Rock Island, Illinois 61204-2004

We appreciate the opportunity to comment on the proposed changes in the regulation of Lake Red Rock. The Iowa Farm Bureau is an organization of farmers and landowners. Many of these farmers in the Red Rock area have been adversely affected by the existence of the Red Rock Reservoir. These landowners did not have a choice in the decision to create the reservoir.

We are currently trying to determine the dollar amount of damage these farmers have experienced since the reservoir began operation in 1969. Your study report says, "The net cumulative damage prevented by the project since it has been in operation, 1969 through 1984, have been $84,629,000 ($12 million in 1984 alone)." Does this net cumulative damage figure deduct crop loss, field tie tile damages, fence losses, and the cost of clean up from debris due to flooding? We would appreciate your assistance if you have dollar estimates on the damage to landowners, both above and below the dam, who have experienced flooding.

The syllabus of your study says, "Short-term deviations, resulting from either abnormal wet or dry periods, cannot be used to justify a renegotiation of easements on impacted lands." We find this hard to understand. If we agree that weather patterns have been so unusual and have affected siltation, that the life of the reservoir has been altered, and that these weather patterns justify changes in the level of the conservation pool, then the deviations from normal weather must surely justify a renegotiation of easements on impacted land.

We know land values and farm operating costs are difficult to project 20 years in advance. We also realize federal legislation and appropriations may be necessary to compensate those who have been damaged far beyond original estimates. We would ask for the Corps support of legislative efforts to help relieve those who have been burdened and ask that you recognize that renegotiation of easements and compensation to damaged landowners, both above and below the dam, is justifiable.

Agriculture is currently experiencing severe economic problems. Those asked to bear the cost of benefits shared by many in the state of Iowa for flood control, conservation and recreation should be compensated.

Sincerely,

Jerry Shepler

Jerry Shepler, Director
Environmental & Local Affairs

ta

PELLA MEDICAL CENTER, P.C.
412 JEFFERSON STREET
PELLA, IOWA 50219

March 27, 1985

Col. William B. Burns, Chief
Rock Island District Corps of Engineers
Department of the Army
Clock Tower Building
Rock Island, Illinois 61201

Dear Mr. Burns:

Here are votes to raise the level of Lake Red Rock to 742 as soon as possible. As ardent supporters and users of the lake for its varied opportunities, we feel that something definitely needs to be done to facilitate better environmental and recreational possibilities. We applaud the recent comprehensive studies that have been done to help better understand the needs of the future. Many of those with whom we have contact are in agreement that raising the permanent level of the lake will best serve everyones needs without jeopardizing the flood control purposes for which it was intended.

Sincerely,

Gene Van Zee M.D.
K Monasa M.D.
[illegible] MD
Stewart Karis MD
John [illegible] MD
[illegible]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

March 29, 1985

Colonel William C. Burns, USA
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building
P. O. Box 2004
Rock Island, Illinois 61204-2004

ATTN: Planning Division

Dear Colonel Burns:

My staff has reviewed the recent report, "Alternatives to the Regulation of Lake Red Rock." Although other commitments prevented our attendance at the March 26 and 27 public meetings we remain very interested in this study. Please keep us informed.

Thank you for the opportunity to review this project. If you have questions or need additional information, please contact Lynn Kring of my staff at (913) 236-2823 or FTS 757-2823.

Sincerely yours,

for Edward C. Vest, Acting Chief
Environmental Review Branch

March 30, 1985

To Col. William Burns, District Engineer
U. S. Army Corps of Engineers
Rock Island, Illinois

In relation to the public meeting in Ottumwa March 26 concerning "Alternatives to the Regulation of Lake Red Rock," I submit the statement which follows.

By way of introduction, I have been a close observer of the Des Moines River for 40 years for these reasons: (1) From my Ottumwa home at 717 Riverside Lane I witnessed the 1947 floods. (2) For 30 years I was a member of the news staff of the Ottumwa Courier and was its editor when I retired. (3) For 20 years I was a member of the Ottumwa Plan and Zoning Commission. During my six terms as its chairman I made numerous trips to Washington, Chicago and Rock Island in the interests of flood control on the Des Moines River, including obtaining funds for planning and construction of Red Rock Dam. (4) Also during my Plan Commission service I was actively involved in achieving the Ottumwa channel straightening and levee system which was locally financed in order not to diminish the benefit-cost ratio which the Corps of Engineers needed to justify construction at Red Rock.

I endorse Alternative No. 1 as presented in the booklet "Alternatives to the Regulation of Lake Red Rock," and as explained by you and members of your staff in the March 26 Ottumwa meeting.

You explained that this alternative is to "maintain a minimum conservation storage volume to provide for recreational opportunities and to supplement the low-flow releases from Saylorville Reservoir."

My endorsement of this alternative is limited by the presumption that the provision of "recreational opportunities" would require no greater portion of Red Rock Reservoir's storage capacity than also is needed to fulfill the present conservation pool requirements.

Congress authorized Red Rock Dam and provided $80 million for its construction almost entirely for its principal purpose, which is flood control. The other justification at the time was maintenance of a minimum flow of 300 cubic feet per second to assure water quality control downstream during dry seasons.

Dams are built for a variety of reasons. For total efficiency, a flood control reservoir would be empty except when the inflow exceeds the normal capacity of the downstream channel. Any and all other purposes assigned to a dam diminish its effectiveness for flood control, whether they be storage for low-flow maintenance, for esthetic reasons, for boating, water skiing, fishing, hunting or other recreational uses, or for the production of hydroelectric power.

Assignment of a minute portion of Red Rock's total storage capacity to low-flow

maintenance was a justifiable decision. It also yielded a fringe benefit — a 9,000-acre lake adequate for recreation and wildlife enhancement.

It is not surprising that some of the capacity of this pool at elevation 725 was lost due to siltation. The Corps already has raised the elevation to 728 for that reason. But it is surprising — and of questionable logic — that the Corps of Engineers would suggest immediate raising of the conservation pool level to elevation 742 simply because its projections see that level as being needed in the first 100 years of the reservoir's use.

I have carefully studied the materials presented at the public workshop on March 26, and I have concluded that raising the pool level any more frequently and in any larger increments than required under Alternative No. 1 would benefit no one except the recreational interests (users and vendors alike), and persons who want to see a mile-wide stretch of water beneath the Highway 14 bridge.

In 1984 Red Rock Reservoir was totally filled because extreme weather conditions produced 278 per cent of a normal year's flow. If there had been more storage capacity, the Corps surely would have used it and reduced the damage caused by the emergency high release rates and sustained high flow.

> What more logical reason could there be for delaying as long as possible any incremental increases in the conservation pool level?

Although it would hide the mud flats and provide more space for recreational boating, increasing the conservation pool beyond the 90,000 acre-feet minimum would accelerate the siltation rate. (Page 30)

It would reduce the margin of safety for owners of 28,382 acres of easement-inhibited farm lands at elevation 760 and above. (Page 8)

It would increase the average annual damages from downstream flooding by as much as 6 per cent. (Page 25)

It would delay the springtime lowering of water tables under crop lands adjacent to the downstream river. (Page 26)

It could cause taste and odor problems in the water supply of the city of Ottumwa. (Page 30)

I challenge the statement on page 31 that "more benefits would be gained than lost."

Alternative No. 1 is the logical choice.

Sincerely,

Lewis C. Debo
717 Riverside Lane
Ottumwa, Iowa 52501
(515) 682-4058

17

SPEED MEMO

STATE	COUNTY
1	50

To Col. Burns Date 3-31-85

From Duane L. Goder Re Red Rock Water Level

The enclosed signatures represent those who wish to see the level of Red Rock raised to 734 immediately.

Thank You.

REPLY DATE

1

125 314 SEND PARTS 1 AND 3 INTACT—PART 3 WILL BE RETURNED WITH REPLY—RETAIN PART 2 FOR FOLLOW-UP IOWA FARM BUREAU & AFFILIATED COMPANIES

We, the undersigned, respectfully request that Lake Red Rock's water level be increased for the waterfowl season to 734 ft. which would provide increased habitat for more waterfowl as well as all migrating birds in their fall flight.

(NAME)	(ADDRESS)	(CITY/TOWN)
Jim Rader	1115 N 9th ave E	Newton Ia
Jim Johnson	922 E 19th St N	Newton Ia
[illegible]	RR#2	NEWTON IOWA
[illegible]	411 E 11 St N	" "
Doug [illegible]	1503 N. 3rd Ave W	Newton Ia.
[illegible]	714 S 3rd Ave W	Newton Ia
Don Lint	710 E 14 St N.	Newton Ia
Robert [illegible]	1137 [illegible]	Newton Ia.
Mark Wagner	419 E. 5th St. N.	Newton, Ia
Craig [illegible]	RR2	Kellogg, Ia
Duane Altemeier	RR#1 Box 444	Newton Ia
[illegible]	RR1	Newton Iowa
Mike Billingsley	RR#3	Knoxville Iowa

We, the undersigned, respectfully request that Lake Red Rock's water level be increased for the waterfowl season to 734 ft. which would provide increased habitat for more waterfowl as well as all migrating birds in their fall flight.

(NAME)	(ADDRESS)	(CITY/TOWN)
Harold Penney	710 - E. 12 St. S.	Newton, IA.
Burt Downing	715 W 5th ST S	Newton, Ia
Herman J. Cypher J.	309 W. 4th St. So.	Newton Ia.
Philip D Lane	R. 2	Newton Ia

We, the undersigned, respectfully request that Lake Red Rock's water level be increased for the waterfowl season to 734 ft. which would provide increased habitat for more waterfowl as well as all migrating birds in their fall flight.

(NAME)	(ADDRESS)	(CITY/TOWN)
John Moore	1406 S. 6 Ave E	Newton
[illegible]	214 E. 4th St N.	Newton
Lynn Jones	406 E 10th St N	Newton
Dean [illegible]	RR 1	"
R.W. Jay Stevenson	RR 1	Baxter
Don Womley	RR 2	Newton
Mark Johnstone	RR 2	Newton
[illegible] White	906 E. 13th St. N.	Newton
Robert J Johnson	618 N 6th Ave E	Newton
[illegible]		Baxter

We, the undersigned, respectfully request that Lake Red Rock's water level be increased for the waterfowl season to 734 ft. which would provide increased habitat for more waterfowl as well as all migrating birds in their fall flight.

(NAME)	(ADDRESS)	(CITY/TOWN)
[illegible]	308 E 19th St N	Newton Ia
Harold Wright	602 So. 13th Ave W	NEWTON
Forest Purdis	327 C.C.A.	Newton
[illegible]	205 N [illegible]	[illegible]
[illegible]	[illegible] St North	
Mike O'Brien	Route 2	Newton
[illegible]	703 W pleasant St,	Colfax
[illegible]	R1	[illegible]
[illegible] Jensen	Rt 2	Newton
[illegible]	1907 N 2nd Ave E	Newton Ia
[illegible]	RR #3, Box 318	Newton Ia
[illegible]	617 [illegible]	[illegible]
[illegible]	R#1 Box 141	Baxter Iowa
Larry [illegible]	R 5	Newton, Ia.
Allen [illegible]	705 [illegible]	Newton Ia

We, the undersigned, respectfully request that Lake Red Rock's water level be increased for the waterfowl season to 734 ft. which would provide increased habitat for more waterfowl as well as all migrating birds in their fall flight.

(NAME)	(ADDRESS)	(CITY/TOWN)
Lowell Case	1214 South [illegible]	Newton Iowa
Floyd Schwieger	1304 So. 4 Ave W	Newton
Ralph B. Henderson	925 W 25 St S	Newton
[illegible]	623 N 19th Ave E.	Newton Ia.
[illegible]	RR# 3 Box [illegible]	Newton, Ia.
[illegible]	623 N 19th Ave E	Newton
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	
Terrence G Mitchell	902 N 7th Ave W	Newton Ia
[illegible] Murphy	[illegible], Ia.	
[illegible]	[illegible]	[illegible]
Robert [illegible]	902 E 5th St N	Newton Iowa
[illegible]	501 [illegible]	
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	Lot 10 [illegible]	Newton, Ia.
[illegible]	RR # 4	NEWTON, IA
[illegible]	Box [illegible]	[illegible]
[illegible]	[illegible] W 10th [illegible]	[illegible], Ia.
[illegible]	106 [illegible]	[illegible]

We, the undersigned, respectfully request that Lake Red Rock's water level be increased for the waterfowl season to 734 ft. which would provide increased habitat for more waterfowl as well as all migrating birds in their fall flight.

(NAME)	(ADDRESS)	(CITY/TOWN)
Dennis Williams	1818 N. 8th Ave. E	Newton
Harold D. Cattell	2014 N. 4th Ave. E	Newton, IA
Jerry W. Jefferson	2415 N. 2ND. AVE E.	Newton, Ia
Larry [illegible]	20 Cherry St	Colfax
Jim Penny	R.R.# 1	Colfax
Steve Bono	1309 W 16th St.	Newton Ia
Ray Chambers	314 S Buchet	Knoxville Ia
Randy Ferguson	1102 E 12 St. So	Newton
[illegible]	RR2 Box 185	Kellogg, Ia.
Rebecca VanBenthuysen	Box 202 305 Polk St	[illegible]
[illegible]	306 E C A.	Newton
[illegible]	CHARITON, IA.	
Jim A Carrell	730 W 2ND St. S.	Newton, Ia
Richard Reed	224 E. Division	Colfax, Ia 50054
[illegible]	2512 N 4th Ave. E.	Newton, Iowa
R. Welcher	RR 2	Newton, IA
Gene Bonnie	719 N. 10 AVE. E.	Newton, IA.
James E [illegible]	R R A	Newton, Ia
[illegible] McDonald	601 E 13th S North	Newton IA
[illegible] L Emerson	R R 1	Colfax
Larry D Horn	227 E 10th ST. S	Newton Ia
Ruth McRoell	311 W 16. St N	Newton Ia
Fred [illegible]	407 East 12th St S	Newton, Ia
Dwayne Masterson	PO Box 284	Reasnor Ia
Ricky Craik	1205 E. 13th St S.	Newton, Ia
Howard H. Bukenbosch	605 1st ave W.	Newton, Ia
Carl W. McGee	806 E 17th St N	Newton, Ia
[illegible] Rush	RR 2	KELLOGG, IA.
Robert Churchill	RR 3	Newton Ia
Ramona White	311 W. 15th St. N	Newton, Iowa
Bill Morgan	504 E 4½ St North.	Newton, Iowa
Clarence [illegible]	819 N 6th Ave E	Newton, Iowa

We, the undersigned, respectfully request that Lake Red Rock's water level be increased for the waterfowl season to 734 ft. which would provide increased habitat for more waterfowl as well as all migrating birds in their fall flight.

(NAME)	(ADDRESS)	(CITY/TOWN)
Tom McKinney	211 E. 24th St. N.	Newton
Bernard Lammers	200 E 23rd St N	Newton
Mike Driskell	400 W. 4½ St. S.	Newton
Scott [illegible]	301 N 19th AVE W	Newton
[illegible]	1002 E 15th ST So	" "
Dan Allison	1050 S. 15th Ave. W. #5	Newton

We would like to enter this statement into the public record for the alternatives to the Regulations of Lake Red Rock.

If the lake level has to be raised to compensate for siltation, easement land holders and operators, support alternative 4, which is to raise the lake level in 3 phases, 732, 736 and then 742.

Also to extend the noncrop season from April 21 to May 1st. On May 1st, if the lake level is above 760, the higher release rate of 30,000 cfs. would continue until May 10 or a lake drop to below 760, to keep water off of, or get water off of easement land. Increase the crop season release rate from 18,000 cfs to 22,000 cfs at Red Rock if lake elevation is above 760.

WeWould also like the Corp of Engineers to support damage payments to land owners and tenants for flooding above and below the dam. The Corp's support would be very helpful and any Congressional legislation that may be forth coming on possible damage payments or crop insurance coverage.

We also would like the Corps of Engineers to support any action to obtain funds for soil conservation practices, to try to stop soil erosion in the lake basin before it reaches the lake.

Ronald E Miller	RR2	Knoxville Ia 50138
Richard A Stevenson	RR2	Knoxville Ia 50138
Reed Smith	RR2	Knox Ia 50138
Arnold McCoy	R.R.1.	Dallas Ia 50062
Carl De Goede	RR2	Pleasantville Ia 50225
Harold D Williams	RFD1	Dallas Ia 50062
Howard Goodhue	RR1	Carlisle, Ia 50047
Robert Stickle	901 W M.	Knoxville, Iowa.
Harlan Marshall	RR1	Monroe Iowa
Allen [illegible]	R2	Monroe IA

April 2, 1985

Gentlemen:

I farm approximately 510 acres of Red Rock Easement property. My father, Kenneth F. Miller, owns 270 acres of this property and I own the remaining 240 acres.

All of this property lies just above the 760 elevation. As you are well aware, it has flooded several times by Lake Red Rock.

After doing some research on the original acquistion of this easment, I can't find anything that says that the Corp of Engineers can maintain a conservation pool over 725 feet MSL.

I believe its past time for the Corp to show a little professionalism to the easment owners, and admit that the orginial flood frequency was a gross miscalculation.

(1)

I believe that the Corp should contact, <u>in person</u> each easment owner and learn what impact the lake has had on their property and livelihood.

Instead of continuing to defend the mistakes made by the Corp, I think its time for the Corp to get behind the easment owners and correct this gross misjudgement.

Personally, I would be willing to sell my property to the Corp for a fair price. I'm sure that my father would also.

I would appreciate a personal response, in the near future, to this letter.

Thomas A Miller

Tel 5159662372 RR#1
or 515 2627988 Runnells Iowa 50237

(2)

District Engineer
Rock Island District
U.S. Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Re: Comments on Raising Permanent Pool Levels of Red Rock Lake

Dear Sir:

I resist any and all actions by the Corps to raise Red Rock Lake levels. The loss in flood storage capacity will directly affect frequency of flooding of easement lands 760 - 780 feet under my control. The Corps has not been able to meet original projections of flood frequency and now seeks to compound the problem in the name of water storage for low flow augmentation. The cities, industries and others who might benefit from said augmentation should pay for the benefits derived by paying upstream landowners and tennants damages.

The siltation problem is not only a problem in the permanent pool area, but is project-wide. The study indicates easement payments were based on crop loss, debris clearing, and siltation problems of drainage and tile systems. I believe that the question of siltation alone was undervalued significantly.

If the Corps continues to raise lake levels they will eventually be forced to buy easement lands. The direct effect will be loss of tax base to the counties and school districts covered by the project area. That on top of an already depressed local economy directly related to losses from farming in the easement areas will cause the entire local economy (an eight county area) to be irreparably harmed.

Regarding recreational and conservation considerations, enough is enough! If the boaters had a 20,000 acre lake, they would want 40,000. The head count of so called day visitors is a figure so inflated by the Corps to justify recreation, that the credibility of the U.S. Army Corps has just dropped another notch. I wonder how many of those day visitors were farmers who visited the dam site in disbelief that an agency of their own government was doing this to them?

In conclusion, my resistance to raising lake levels is as follows:

1. Increased flooding will result both on easement lands and downstream.
2. Cities and industries downstream should pay for any benefits in the form of damages to upstream landowners.
3. Original easements were not enough.
4. Outright purchase of easement lands will affect local tax base and economy.

5. Recreation interests will not significantly benefit from a raise in pool levels.

Sincerely,

James R. Richards
R.R.1 Box 25
Hartford, Iowa 50118

REGARDS RED ROCK LAKE PROPOSALS

Corps of Engineers;

I personally would LIKE to see the level of the lake to 736 feet; IF there would be no danger to the people who live below the dam. For it would have a very positive effect for the community. An aesthetic improvement, safer boating (which a higher water level would give) plus some positive imput from the community could have an economical benefit to this area.

Questions ,however, arise. Won't increasing the lake level also increase the rate of siltation? If the Lake is raised to the 736 feet, in view of the water we had in 1984 , does that leave a large enough reservoir to handle a repeat of the amount of water we had in 1984? Last, I understand that some of the farmers are objecting to the proposed project of ele vating the level of the Lake. I would like to know why they are objecting. I am under the impression that they received pay of the land. Am I right or wrong? Is flood insurance available for the easement land: and considering the fact that the farmer is losing money on every acre he plants why farm the land:::: ?

Having walked most of the circumfance of the lake I have noted that much of the shore line is a clay-~~xxxxx~~ sand soil type, soft shale, with outcroppings of granite of varing hardness; the feeder streams flow thru farm land where there is a minimun or conservation practiced. (ergo SILT) Am I correct in my assumption that we have an extremely friable shorelin e? Why is an 18 month stuly needed:: ? Soil surveys have already been done; a months well designed field work would ans wer a multitude of questions.

Finally regardless of the final decision that is made; I respectfully submit the request that while the lake is low that the corps have a crew of menpile and burn the driftwood that has accumilated on the shores of the lake. When the lake comes up the wood floats free; it creates a hazard on the lake. At present it is an eyesore plus we cannot enjoy the lake from the land in the many places that is accessable to hikers.

Blanche E. Bodie
Rt. 3, Box 92
Knoxville, Iowa 50138

Ph 842 1291
842-5695

Lake Red Rock Marina

Route 1, Pella, Iowa 50219 515-627-5743

April 6, 1985

Col. William C. Burns, Commander
Rock Island District Corps of Engineers
Department of the Army
Clock Tower Building
Rock Island, Illinois 61201

Re: Red Rock Dam and Red Rock Lake
Lake Red Rock Marina
Lease Contract # DACW25-73-193

Dear Colonel Burns,

At least half of the conversations at the marina begin with, "Well, when is the lake level going up?" And the other half get around to it before they leave. The meetings of ten days ago are still the chief interest of everyone who comes to the lake and a good many who shop and coffee anywhere in central Iowa. Fishing is great this season. That helps keep us on top topic list.

Those three meetings I attended seemed to be quite an exercise in democracy. They were very fair in giving everyone a chance to speak no matter what the complaint, the idea or request for damages. No comment, just a hearing. It seemed that this must be stage one in conflict resolution presented by the United States Army.

I suppose that our understanding and acceptance of a lake level rise in dramatic increments is heavily weighted by the benefit that the much larger lake would give us. However, I have found that when I have offered the blue sheets with the four alternatives listed on them to someone wanting to discuss the subject, they have been greedily received. If, at this point, there are still anymore of those left from the meetings, I would be most happy to have them sent to the marina. The five or six copies I ended up with are gone.

We do look forward to receiving the newsletter you mentioned as the process of decision making works out. Perhaps that newsletter would take the place of the request I made above for copies of the blue sheets with the 4 alternatives presented.

The visit you made to the marina to personally view the situation about which we have written and made request is very much appreciated. It surely helped relieve the feeling of isolation we have felt as a concessionnaire of the Corps of Engineers. We do look forward to finding cooperative ways of meeting our needs to serve more of the boating public in a cost-effedtive manner.

Now that this non-farm oriented outlander (Newton is 30 miles away) has experienced the hot bed of anger which surrounds the lake and causes it to be bad-mouthed by its closest neighbors, I can work more effectively in the Lake Association and in marina development.

Thank you, [signature]

Iowa State Sheriffs' & Deputies' Association

John Evans, President
Chief Deputy, Story County
Nevada, Iowa 50201
Phone: (515) 382-6566

Bill Havenhill, Secretary-Treasurer
Sheriff, Louisa County
Wapello, Iowa 52653
Phone: (319) 523-4371

Lloyd Kalovsky, Public Relations Director
424 - 10th Street, Suite 210, Des Moines, Iowa 50309
Phone: (515) 288-9030

April 16, 1985

Col. William C. Burns
Department of Army
USAED, Rock Island
Corp of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Col. Burns:

After some years of very bad boating experience at Saylorville Lake, I took my 35 foot houseboat to Lake Red Rock Marina at Red Rock. I had heard that they are cooperative and it would not be crowded. Rathbun was just too far for the kind of boating I want to do and the freedom to come and go without spending half a day in travel.

Now the young manager there tells me that there may be some problem with launching my boat because the ramp is all silted in, or partially so. He says he thinks that the Red Rock Corps is going to help get that cleared off and they will get my boat in or let me know very soon. I urge you to see that that is done!

I do not know why, when these public facilities are built by the Corps, they cannot be maintained for safe use. It would seem to be desasterous waste of my money as a taxpayer, and every other taxpayer, to not see that the facilities built for taxpayers are kept in good shape. I should think that Red Rock Marina would have a right to expect that that public ramp be kept and maintained for safe use.

In the same way, I certainly hope that Red Rock Lake is raised to the maximum (742) level to benefit boaters. We don't need a mud puddle in the middle of Iowa. We can benefit from, use, and be proud of a lake where the state and federal governments work together to make it good for the most possible uses; fishermen, hunters, sailors, and my friends and me with my houseboat.

Sincerely,

Lloyd S. Kalovsky
Lloyd S. Kalovsky
Public Relations Director

103 Years of Service for the People of Iowa

Marion County Conservation Board

COURTHOUSE

KNOXVILLE, IOWA 50138

April 25, 1985

Mr. A. Thomas Wallace
Federal Funds Coordinator
Office of Planning and Programming
Captiol Annex
Des Moines, Iowa 50319

Dear Mr. Wallace:

After having a chance to read over the publication entitled Alternatives to the Regulation of Lake Red Rock, developed by the U.S. Army Corps of Engineers and attending the Wednesday (March 27th) afternoon meeting on this subject held in Knoxville, I would like to offer a few comments if I may.

Of the four alternatives outlined by the Corps of Engineers, I feel it best to follow alternative #4 which would raise the lake in a three phase operation. First to elevation 732, then 736 and finally 742. This would benefit wildlife and fisheries management the most.

Another objective I would like to see the Corps of Engineers look at seriously would be that of putting in a floor control gate in the overflow structure that connects Roberts Creek Park with Lake Red Rock. According to the Corps, Roberts Creek Park represents less then 1% of the total flood plain of Lake Red Rock, but represents a major recreational area around the lake with thousands of people visiting each year. Then high waters from Lake Red Rock back into Roberts Creek Park, the swimming beach goes under water, roads are closed, fishing is messed up, waters turn muddy and boating becomes dangerous. This flood control gate would be closed until the last posssible time when it could be opened if the additional flood space was needed. This type of structure would greatly benefit the management of the park since flooding would or could be reduced.

Thank you for your time and the opportunity to express my views.

Sincerely,

Steven B. Edwards

Steven B. Edwards
Executive Director
Marion County Conservation Board

Office for Planning and Programming

Iowa

Capitol Annex, Des Moines, Iowa 50319 Telephone (515) 281-3711

TERRY E. BRANSTAD
Governor

EDWARD J. STANEK, PhD
Director

April 29, 1985

COL William Burns, District Engineer
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building
P. O. Box 2004
Rock Island, Illinois 61201

RE: IA850325-222

Reply to the Attention of NCRPD-P

Dear COL Burns:

The review of the information contained in the Corps of Engineers publication Alternatives to the Regulation of Lake Red Rock was coordinated through the Iowa Interagency Resource Council (IARC). This organization met today and agreed upon the comments and the position the State has at this time in relation to the alternatives and related matters concerning Red Rock Lake. The comments are attached hereto.

The State Clearinghouse which is the designated single point of contact for Iowa is forwarding these comments and recommendations as a State Process Recommendation. The Clearinghouse requests a reply in accordance with DOD Regulations 384.10. This reply will be referred to IARC.

Thank you for your cooperation.

Sincerely,

A. Thomas Wallace

A. Thomas Wallace
Federal Funds Coordinator

COMMISSIONERS
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BAXTER FREESE Vice-Chairman Wellman
JOHN D. FIELD – Hamburg
MARIAN PIKE – Whiting
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THOMAS E. SPAHN – Dubuque
RICHARD THORNTON – Des Moines

IOWA CONSERVATION COMMISSION

Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319
515/281-5145

An EQUAL OPPORTUNITY Agency

April 29, 1985

Colonel William C. Burns
District Engineer
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

The Iowa Interagency Resource Council has had an opportunity to review "Alternatives to the Regulation of Lake Red Rock" and would like to comment on the alternatives given in the report. The agencies tried to keep in mind the effect a change in regulation of Lake Red Rock would have on downstream flooding, flooding on easement lands, maintenance of desirable downstream flows, boating activities, fish and wildlife resources, wildlife management lands, and many other concerns.

Maintenance of adequate minimum downstream flows and in-reservoir water and sediment storage capacities are desirable. To meet these objectives, obviously some change in permanent conservation pool must be made. Also, three of the alternatives would involve changes in release rates when pool elevation exceeds 760 feet NGVD. Each alternative has some advantages and disadvantages. However, on the whole, alternative #4, the phased (732, 736, 742 NGVD) increase with altered release rates when the pool exceeds 760 feet NGVD and a two-foot fall raise from September 15 to December 15, seems to be the best alternative. This alternative would recapture the 90,000 acre-feet storage capacity, increase the aesthetic quality of the lake, provide more boatable water, and not have a detrimental impact on fish and wildlife management.

There are several points of concern that need to be addressed for future reservoir management. All of these are highlighted by the fact that all four alternatives end at the same point--742 NGVD. The first concern is downstream flooding and damage resulting from increased pool elevations. This is referenced on page 25 but no action plan is provided. The Lake Red Rock regulation plan should recognize and attempt to minimize the adverse impacts that sustained high water levels would have in the Des Moines River floodplain below the reservoir. The second concern is the fear of increased flooding of easement lands with increased pool elevations. This fear will no doubt surface with any future pool adjustments. If raising the conservation pool elevation or modifying the reservoir regulation plan causes damages to farmlands located in the reservoir flood pool beyond those damage levels

originally projected for the project, the COE should develop a plan to minimize such damages. The third concern is the effect increased pool elevations will have on tributary streams. This is mentioned on pages 19 and 20 but no solution is proposed. No doubt increased meandering of tributary streams caused by Red Rock pool elevation increases will cause problems. A fourth concern is that the COE should include a low flow contingency plan in its Lake Red Rock regulation plan. This contingency plan should be based on maintaining a minimum desired low flow of 300 cfs in the Des Moines River at Ottumwa, and should take into account both the frequency and duration of low flow events. The provisions of the Saylorville Lake low flow contingency plan should be taken into account, as should the impacts of reduced water volumes in the conservation pool as sedimentation occurs. A fifth concern is possible sediment control. The COE should conduct studies to determine whether actions to reduce the rate of reservoir sedimentation are desirable and feasible. These studies should quantify which sediment sources and tributary streams contribute to the reservoir sedimentation loads. Critical areas of sediment production and alternative measures which could be used to reduce the volume of sediment entering the reservoir should be identified. The evaluation of alternative sediment control measures should consider both measures by which sediment production from critical areas could be reduced and measures by which sediment delivery from tributary streams might be prevented from reaching the reservoir. The evaluations should consider the technical, environmental, and economic feasibility of alternative control measures.

The Iowa Interagency Resource Council would like to thank you for the opportunity to comment on this preliminary report. If new information becomes available, we would like to be able to consider that information. The COE should periodically (at least once every six months) hold meetings to inform the state natural resource agencies on the status of the EIS and revised reservoir regulation plan. The COE should also consult with appropriate state agencies on major issues related to the regulation plan or EIS.

Sincerely,

[illegible] WILSON, DIRECTOR
IOWA CONSERVATION COMMISSION

JAMES GULLIFORD, CHAIRMAN
IOWA INTERAGENCY RESOURCE COUNCIL

(rlt:L43)

Red Rock Reservoir Operating Level

Position Statement, Des Moines Chapter Izaak Walton League

For Release May 6, 1985.......For Further Info; Lee Dallager
515-284-7369

The Red Rock Reservoir since completion has been invaluable in flood protection for people and property in the flood zones down river. Many conservation and recreation benefits have also resulted from the Red Rock Project.

Several problems have developed with Red Rock since completion:

1. Siltation is occurring at a rate exceeding previous expectations with resultant lesser water capacity.

2. Numerous adjacent Farmer/Landowners have sustained damage more often than expected due to several unusual years of extreme rainfall in closely spaced periods.

3. Due to present federal policy in effect, affected landowners have been unable to sell affected land or or renegotiate easements.

The Army Corps of Engineers has been involved in detailed extensive studies of the Red Rock problems and has listed four alternatives to the present operation which include options ranging from "no change" to a "one time increase" of the operating level from 728 ft. to 742 ft. All of the options would include further studies and experimentation with "release rates".

It does appear that eventually, whether by gradual increments or by a one time raise, the operating level will have to be raised to the 742 ft. level.

It would appear that damages to involved landowners could be as frequent and extensive as in the past, regardless of which option of level of operation is adopted.

Considering all affected interests, the one time raise to 742 ft. is the best of the alternatives. Under the present Congressional and Political climate, renegotiation of easements or fee title transfers of affected lands would be more likely under the "one time raise" option.

Damage to adjacent landowners is a situation that must be resolved as a matter of fairness. We must not, however, let the landowner damage appear as the only problem with which to be concerned. In looking ahead, we must keep in mind the extensive siltation at Red Rock, and elsewhere, and once again emphasise that no progress is really being made in the area of topsoil loss upstream or down. We all should be concerned and a concerted effort should be made toward better watershed protection and soil conservation in our river basins.

Des Moines Chapter Izaak Walton
Executive Board, 5-2-85

Bill Hedrick

Bill Hedrick, President

STEENHOEK AUTO SUPPLY, INC.

AUTOMOTIVE PARTS DISTRIBUTORS

824 MAIN ST.

PELLA, IOWA

5-8-85

U.S. Corps of Engr.,

I favor raising the lake level 14 feet at one time.

Our family boat and fish Lake Red Rock as often as four times a week during spring fishing. We have noticed the lake getting shallower and this April we could only find three feet of water in the middle of the lake at Roberts Creek outlet. We also tried to fish White Breast Creek but found only inches of water at the creek outlet into the lake.

I know that you are aware of the problem and urge you to raise the level 14 feet and again make Lake Red Rock a lake our family can make full use of.

Chuck Van Zante
508 Franklin
Pella, Iowa

Congress of the United States
House of Representatives
Washington, D.C. 20515

May 9, 1985

Colonel William C. Burns
District Engineer
Rock Island District, Corps of Eng.
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

I would first like to commend the Army Corps for the exhaustive and detailed study done for the report Alternatives to the Regulation of Lake Red Rock. The report has been very helpful in clarifying the problem and the solution alternatives.

As you may know, Congressman Neal Smith has endorsed the second alternative in the report--to raise the level from 728 feet above sea level to 742 in one step.

After listening to the views of area residents and considering the various alternatives, I, too, believe that the second alternative is the most satisfactory. Raising the level to 742 in one step would cause the easement land to be flooded more often than under the original easement agreement. I understand that perhaps the Corps would therefore have the authority to renegotiate those easements and buy the land that owners would prefer to sell rather than keep it under easement.

If it were determined that the adverse impact of raising the level allowed the Corps to renegotiate those easements, Congressman Smith is confident that he could secure the necessary appropriation.

A renegotiation of these easements with a buy-out would seem to settle the problem once and for all, precluding the yearly complaints and claims for damages. In addition, it would improve the aesthetics of the lake and provide better opportunities for recreation.

Thank you for your attention to this matter. Please contact me if you have any questions or comments regarding this proposal.

Sincerely,

Jim Lightfoot

JIM LIGHTFOOT
MEMBER OF CONGRESS

ederal Building
0 Walnut Street
es Moines Iowa 50309
515) 284-4890

28 Federal Building
31 1st Street S.E.
dar Rapids Iowa 52401
91 399-2566

United States Senate

CHARLES E. GRASSLEY
135 Hart Senate Office Building
Washington, D.C. 20510
(202) 224-3744

228 Post Office and Court House Building
320 6th Street
Sioux City Iowa 51101
(712) 233-3331

210 Waterloo Building
531 Commercial Street
Waterloo Iowa 50701
(319) 232-6657

May 9, 1985

Colonel William Burns
U.S. Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

I am writing to clarify my understanding concerning the water level at Lake Red Rock.

Yesterday, Mr. Fred Schuster of my Des Moines Office, talked about rumors that the Corps was going to raise the water level to 730' shortly. You assured him that although you had considered raising the level, you have now decided not to increase the level either officially or unofficially.

I also understand the water level is increased on a seasonal basis, during the winter months, for the benefit of hunters. Once the winter months are over, the level is again reduced by two feet to the 728' level.

My concern is that the level not be officially or unofficially increased above the 728' level without proper procedures being followed including, but not limited to, another public meeting in the Red Rock Area. I would also espect my office to be notified far in advance as well.

Please send all responses or notices to my Des Moines Office.

Sincerely,

Chuck Grassley

Charles E. Grassley
United States Senator

CEGw/fs

Committee Assignments:

BUDGET

LABOR AND HUMAN RESOURCES
CHAIRMAN, Aging

FINANCE
CHAIRMAN, Oversight of the Internal Revenue Service;
Estate and Gift Taxation;
International Trade

JUDICIARY
CHAIRMAN, Administrative Practice and Procedure;
Immigration and Refugee Policy;
Constitution

SPECIAL COMMITTEE ON

Congress of the United States
House of Representatives
Washington, D.C. 20515

May 9, 1985

Colonel William C. Burns
District Engineer
U.S. Army Corps of Engineers
Clock Tower Building - P.O. Box 20004
Rock Island, Illinois 61204-2004

Dear Colonel Burns:

This is in response to your invitation for comments concerning "Alternatives to the regulation of Lake Red Rock" in which you list four alternatives. Please be reminded that the undersigned represent the areas which contain the Red Rock Reservoir.

It appears from the alternatives listed as a result of your detailed extensive studies that eventually, whether by gradual increments or a one-time raise, the operating level of the Reservoir needs to be raised to the 742 foot level. We believe it would be more desirable to raise the operating level to 742 feet in a one-time raise rather than by gradual increments; and that this decision should trigger and be accompanied by an opportunity for land owners effected by this change in operation procedure to either make a voluntary sale of their land to the Corps of Engineers or renegotiate the easements on their land.

Although we understand a final determination has not been made as to the effect on the owners whose land is subject to a flowage easement, we believe that the frequency of flooding which can be anticipated, at lease for those at the lower levels of the Reservoir, which now own land subject to easements will be effected and that action should be taken as promptly as possible to renegotiate their easements or give them an opportunity to sell the land affected.

Sincerely,

Neal Smith
Neal Smith
Member of Congress

Jim Lightfoot
Jim Lightfoot
Member of Congress

Polk County Conservation Board

JESTER PARK
GRANGER, IOWA 50109

ROBERT T. HAMILTON, Executive Director
Telephone Numbers/Area Code 515
Administration Office 999-2557
Forestry 999-2557
Naturalist Programs 999-2557
Jester Park 999-2559
Chichaqua Habitat 967-2596
Easter Lake Park 285-7612
Thomas Mitchell Park 967-4889
Jester Park Golf Course 999-2903
Yellow Banks Park 266-1563
Easter Lake Beach 243-9647
Browns Woods 999-2557
Fort Des Moines Park 999-2557
Mallys Park 967-4889

July 2, 1985

US ARMY CORPS OF ENGINEERS ROCK ISLAND
Attn: NCR--PD-R
Clock Tower Building
Rock Island, Illinois 61204-2004

Sirs:

Enclosed is a copy of a position statement originated by the Des Moines Chapter, Izaak Walton League, regarding regulation of Red Rock Lake.

In official action on June 12, the Polk County Conservation Board voted to endorse that position statement.

Sincerely,

Robert T. Hamilton
Director

clh

Enc.

POSITION STATEMENT

The Red Rock Reservoir since completion has been invaluable in flood protection for people and property in the flood zones down river. Many conservation and recreation benefits have also resulted from the Red Rock Project.

Several problems have developed with Red Rock since completion:

1. Siltation is occurring at a rate exceeding previous expectations with resultant lesser water capacity.

2. Numerous adjacent Farmer/Landowners have sustained damage more often than expected due to several unusual years of extreme rainfall in closely spaced periods.

3. Due to present federal policy in effect, affected landowners have been unable to sell affected land or renegotiate easements.

The Army Corps of Engineers has been involved in detailed extensive studies of the Red Rock problems and has listed four alternatives to the present operation which include options ranging from "no change" to a "one time increase" of the operating level from 728 ft. to 742 ft. All of the options would include further studies and experimentation with "release rates".

It does appear that eventually, whether by gradual increments or by a one time raise, the operating level will have to be raised to the 742 ft. level.

It would appear that damages to involved landowners could be as frequent and extensive as in the past, regardless of which option of level of operation is adopted.

Considering all affected interests, the one time raise to 742 ft. is the best of the alternatives. Under the present Congressional and Political climate, renegotiation of easements or fee title transfers of affected lands would be more likely under the "one time raise" option.

Damage to adjacent landowners is a situation that must be resolved as a matter of fairness. We must not, however, let the landowner damage appear as the only problem with which to be concerned. In looking ahead, we must keep in mind the extensive siltation at Red Rock and elsewhere, and once again emphasise that no progress is really being made in the area of topsoil loss upstream of down. We all should be concerned and a concerted effort should be made toward better watershed protection and soil conservation in our river basins.

IOWA CONSERVATION COMMISSION

Larry J Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319-0034
515/281-5145

An EQUAL OPPORTUNITY Agency

July 2, 1985

Colonel William C. Burns
District Engineer
Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

This Iowa Conservation Commission is requesting your cooperation and assistance in providing waterfowl habitat in the upper region of Lake Red Rock during the 1985 fall waterfowl migration.

The Iowa Conservation Commission requests that the lake be held at the elevation 734.0 msl, instead of holding the level at 728.0 or 730.0 msl. During years such as this, when low water levels occur during the summer, considerable amounts of desirable vegetation are present in the Red Rock Wildlife Area. To make this available to waterfowl and other migratory birds, the area must be flooded at an elevation of 734.0 msl.

As you know, additional siltation each year makes it more difficult to operate a boat in the wildlife area. The past high water years have resulted in a tremendous silt load being deposited in the upper reaches. Most of the waterfowl hunting on Red Rock is done by boat and at elevation 730.0 msl, it is almost impossible to boat from our main boat ramp. However, by holding water levels at the 734.0 msl elevation, over 3,000 acres will be accessible by boat and approximately 5,000 acres of excellent habitat will be made available to migratory birds.

The Red Rock area is one of Iowa's most popular waterfowl hunting places. According to the hunting data, about 5,000 duck hunters use the area. They harvest over 8,000 ducks and 500 geese each year. The 1985 Iowa waterfowl season will start September 21, 1985, and will extend until late November or early December. It is during this time that we would like to have the temporary increase in the water level.

If it is not possible to maintain the 734.0 msl elevation this fall, the closest elevation to 734.0 would be desirable. At a very minimum, we will need 732.0 msl to provide some waterfowl hunting and desirable habitat for migratory birds.

We appreciate your cooperation, and hope you can act favorably upon this request.

Sincerely,

LARRY J. WILSON, DIRECTOR
IOWA CONSERVATION COMMISSION

(rlt:L07)

[...]ate Office Building
[...], DC 20510
[...]3744

[...]deral Building
[...] Walnut Street
[Des] Moines, IA 50309
[...]) 284-4890

[2]06 Federal Building
101 1st Street S.E.
Cedar Rapids, IA 52401
(319) 399-2555

United States Senate

CHARLES E. GRASSLEY

103 Federal Courthouse Building
320 6th Street
Sioux City, IA 51101
(712) 233-3331

210 Waterloo Building
531 Commercial Street
Waterloo, IA 50701
(319) 232-6657

116 Federal Building
131 E. 4th Street
Davenport, IA 52801
(319) 322-4331

September 5, 1985

Colonel William C. Burns
District Engineer
U.S. Army Corps of Engineers
Clock Tower Building - P.O. Box 20004
Rock Island, Illinois 61204-2004

Dear Colonel Burns:

This letter is in reference to the various studies concerning raising the water level of Lake Red Rock from 728' to 742'.

It is my understanding there are several factors that must be considered before your decision on a final recommendation on raising the level in either one, two or three steps is finalized. Currently these factors, which include the Environmental Impact Statement, hydraulic study and public comments, will all be combined in a final report by October, 1986.

I agree with Congressmen Neal Smith and Jim Lightfoot, who earlier wrote to you urging that the water level should be increased to the 742' level in one-step with the understanding and belief that such an action would trigger the "significant change in operation" clause in the easement contract. This would open up further negotiations with the easement owners. This could lead either to the voluntary sale of the affected land or renegotiation of easements on affected land.

I think it is important that decisions be made expeditiously and in favor of the one-step increase so that these farmers do not suffer any further damages to their land.

Sincerely,

Chuck Grassley

Charles E. Grassley
United States Senator

CEGw/fs

United States Senate
CHARLES E. GRASSLEY
135 Hart Senate Office Building
Washington, D.C. 20510
(202) 224-3744

Senators Grassley and Harkin and Congressmen Leach and Lightfoot and the Iowa Farm Bureau are interested in knowing the various costs to you that are directly attribu... to the backwaters of Lake Red Rock.

If you own land and were paid an easement right, but you have been flooded in excess of what you have been paid for, then please take the necessary time to complete this questionnaire.

1. What was the projection by the Corps for flooding of your land by Red Rock backwaters? (e.g. once every 5 years)__________.

2. How many times has your land actually been flooded since 1969?__________. If you have more than one affected farm, please indicate.

3. Has your land flooded more than once in any one year? If so please indicate the number of times and the year(s).__________.

4. Number of acres flooded each time. Please give acreage and year(s).

____________________.

5. In the years flooding occurred (over the projection by the Corps) what were the amounts of damages for:

	1984	1983	1982	1981	Total since 1969.
A. Crops					
B. Pasture					
C. Other (list)					

6. How many man-hours were required for cleaning up debris after the water had receded? Again list by year.

1984	1983	1982	1981	Total since 1969

7. What has been your cost, due to flood damage for such items as fence repair and retiling?

	1984	1983	1982	1981	Total since 1969
fence repair					
retiling					

8. How much did you pay in property taxes on your flooded land?

1984	1983	1982	1981	Total since 1969

9. How much was your easement payment for and in what year did you receive it?

10. Which of the below listed solutions would be most acceptable to you as a agreement between you and the Corps? Please circle your choice.

   A. Buy out of affected land
   B. Crop insurance, with government making up the difference between uplan prices and flood plain risk.
   C. Compensation for additional damage beyond what was projected by the Co
   D. Other (describe)

Please Print your name, address and county and return this questionnaire to Senator Charles Grassley, 721 Federal Building, 210 Walnut, Des Moines, Iowa 50309.

Print name__________

Town__________ Address__________

__________ County__________

Federal Building
Walnut Street
Des Moines, IA 50309
(515) 284-4890

Federal Building
First Street S.E.
Cedar Rapids, IA 52401
(319) 399-2555

United States Senate

CHARLES E. GRASSLEY

210 Waterloo Building
531 Commercial Street
Waterloo, IA 50701
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116 Federal Building
131 E. 4th Street
Davenport, IA 52801
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September 11, 1985

Following is a recap of the results of the Questionnaire commissioned by Senator Grassley, together with Senator Harkin's office, the Iowa Farm Bureau, and representatives of Congressmen Leach and Lightfoot.

PURPOSE AND HISTORY

The purpose of the questionnaire was to obtain direct feedback and data from those farmers affected by the operations of Red Rock Dam, particularly those farmers who were paid an easement in the 1960's, based on a projection by the Corps of Engineers as to the number of times their land could be expected to flood over a given period.

From the beginning, the Red Rock Dam has been treated differently from any known dam currently in operation, in the respect that the Corps has used easements, instead of outright purchase of affected land between the elevations of 760 and 783 feet above sea level. Land below 760 feet was purchased outright, while land above 783 feet was neither purchased nor subject to easement. (The actual projection of the Corps was that no flooding would occur above 780 feet, but easement on the additional three feet was purchased as a precautionary measure.)

The purpose of the dam was for flood control, with hydro electric power and recreational activities as additional benefits. Many people feel that operations of the dam have been structured to favor individuals with boating interests. For example, the original conservation pool level was set at 722 feet, raised to 725 feet, and finally to 728 feet. A study is under way at this time to consider raising the level to 742 feet, in one, two or three stages. The purpose for increasing the level is not related to flood control, but rather to the aesthetics and improved access from the marina to the lake.

From its beginning in 1969, the projections by the Corps have been incorrect. They projected the dam would not be filled until 1972; whereas it was filled later in 1969, due to unusually heavy rains that year.

RECAP OF RESPONSES TO QUESTIONNAIRE

Q-1. What was the projection by the Corps for flooding of your land by Red Rock backwaters? (e.g. once every 5 years)

A According to a telephone conversation with George Wells of the Corps of Engineers, projection of "once every five years" means exactly that--the land should flood, on an average, one time in a given five-year period (or 20 times in 100 years.) See Table 1.

How many times has your land actually been flooded since 1969? ____________. If you have more than one affected farm, please indicate.

See Table I.

TABLE 1 RECAP

Using the first example, the Corps projected this specific parcel would flood once in five years (Col. 1).

Column 2 tells us, on the average, that a parcel of land would flood once every so-many years during the 16 year period of time that the dam has been in operation. This land actually flooded four times, (Col. 3), during the 16 year period. This means that, on the average, the land would flood once every four years, (Col. 4) which would be a 25% increase, (Col. 5), over column 2.

To arrive at the figures in column's 2 and 4, we divide the figures in column's 1 and 3 by 16, which represents the 16 year period, 1969-1984, that Lake Red Rock has been in operation.

Surveys shown in Table I are listed in the order received.

The reason the Corps gives for the large variances is that the 16 years involved have been the wettest in the last 112 years.

Q-3. Has your land flooded more than once in any one year? If so, please indicate the number of times and the year(s).

Q-4. Number of acres flooded each time. Please give acreage and year(s).

A See Table II.

Table II reports the number of times during a given year a parcel of land was flooded more than once, together with the number of acres affected or actually flooded.

In addition to crop loss from excess flooding, a farmer must bear the additional expense of fertilizer, seed, labor and other production costs related to replanting and clean-up.

Logs and other debris carried by the high water destroyed fences, rendered the tiling useless, clogged and covered the outlets and washed away topsoil.

Q-5. In the years flooding occurred (over the projection by the Corps) what were the amounts of damages for: 1984, 1983, 1982, 1981? Total since 1969? Categories: Crops, pasture and other.

Q-6. How many man-hours were required for cleaning up debris after the water had receded? Again list by year. 1984, 1983, 1982, 1981. Total since 1969?

Q-7. What has been your cost, due to flood damage for such items as fence repair and retiling? 1984, 1983, 1982, 1981. Total since 1969? List fence repair and retiling separately.

A See Table III.

Table III shows expenses incurred by farmers by flooding over and above the projection made by the Corps. In other words, if it was projected that a parcel of land would flood once in five years, but actually flooded three times in that period, the costs include two of the periods instead of three--dealing only with the flooding in excess of the original projection. Reasonably, it can be assumed that these figures represent the higher loss years.

Q-8. How much did you pay in property taxes on your flooded land? 1984, 1983, 1982, 1981. Total since 1969?

A See Table IV.

Table IV summarizes property taxes paid on affected land during the years it was flooded.

Q-9. How much was your easement payment and in what year did you receive it?

A See Table V.

Farmers did benefit in this instance because on easements effective in 1965 they had at least three years of "free use" of the funds before the land was affected by backwaters.

Table V lists amounts paid for easements and the year paid.

Comparing the total amount paid for easements in Table V ($735,000) with additional expenses relating to excess flooding in Table III ($6,098,302), and taxes paid during flood periods in Table IV ($427,969), the difference is a whopping $5,791,271.

Q-10. Which of the below listed solutions would be most acceptable to you as an agreement between you and the Corps? Please circle your choice.

A. Buy out of affected land
B. Crop insurance, with government making up the difference between upland prices and flood plain risk.
C. Compensation for additional damage beyond what was projected by the Corps
D. Other (describe)

A See Table VI.

Table VI summarizes the proposed solutions by the affected farmers. As you can see the choice of the majority is compensation for the flooding over and above the original projection by the Corps.

SUMMARY

In reviewing the questionnaire, several points stand out. The main point is the large subsidy that farmers have contributed to the operation of the dam. The amount paid for easements was $735,000 The expenses associated with the easement lands included: $40,835 for tiling, $41,111 in fence repairs, $71,364 in labor clean-up (based on 11,894 hours @ $6.00 per hour, and finally, $6,004,462 in crop damages, for a total of $6,585,741 in additional expenses for the flooding over and above the easement payments allowed by the Corps.

The inflation rate from January 1, 1968 through December 31, 1984, was 117%. Thus, adjusted for inflation, the easements would amount to $1,594,950. Even with adjusting the easement payments to 1984 dollars, and not adjusting the expenses to 1984 dollars, it means that for every one dollar received in easements, the farmer spent an additional $3.13. Without the adjustment, the figure would have been $7.96.

The second point concerns the projections by the Corps. Their projection was correct only 10% of the time with respect to the frequency of flooding. This projection was used in making the easement payments. The Corps was underprojecting 77% of the time, resulting in farmers receiving less money because the Corps had underprojected the number of times their land would flood. Some of the projections were off by as much as 3900%. The Corps had overprojected flooding only 13% of the time.

Finally, the solution requested most often by the farmers was for compensation on a "per flood" basis. There is some evidence that most farmers probably would have preferred a buy-out of affected land, if they could have been guaranteed a fair value for their land. This is believed because some 15% of the questionnaires included in the response that this would have been the preferred option.

Currently the Corps is checking to make sure it has the authority to raise the water level to the 742 foot level. This authority is expected to be granted. In addition, the Corps is considering whether to raise the water level in one, two, or three stages. The Corps states this decision will be based on a multitude of factors: the Environmental Impact Statement, a hydraulic study, and public input. The Corps has projected to make a final recommendation by October, 1986.

TABLE I 1/

Col. 1 Corps projected flooding once every "x" years	Col. 2 Projected frequency (an average of once every "x" years) 1969-1984	Col. 3 Actually flooded 1969-1984	Col. 4 Actual flood frequency (an average of once every "X" years) 1969-1984	Col. 5 Percent increase or (decrease) over projection
5	3.2	4	4.0	25
10	1.6	6	2.7	69
30	.5	7	2.3	360
100	.2	3	5.3	2550
19	.8	5	3.2	300
15	1.1	6	2.7	145
20	.8	4	4.0	150
5	3.2	5	3.2	-
50	.3	2	8.0	2566
40	.4	6	2.7	575
7.5	2.1	5	3.2	52
20	.8	3	5.3	563
40	.4	5	3.2	700
5	3.2	6	2.7	(16)
20	.8	3	5.3	563
40	.4	3	5.3	1225
18	.9	6	2.7	200
16	1.0	3	5.3	430
5	3.2	7	2.3	(28)
13	1.2	5	3.2	166
7.6	2.1	6	2.7	29
12	1.3	7	2.3	77
5	3.2	6	2.7	(16)
16	1.0	3	5.3	43
10	1.6	6	2.7	69
13.5	1.2	5	3.2	167
5	3.2	6	2.7	(16)
12	1.3	10	1.6	23
80	.2	13	1.2	500
7.6	2.1	7	2.3	9
15	1.1	5	3.2	190
40	.4	5	3.2	700

1/ NOTE: Tables I-VI were retyped for clarity.

100	.2	2	8.0	3900
5	3.2	2	8.0	234
6	2.7	6	2.7	-
6.3	2.5	6	2.7	8
6.3	2.5	6	2.7	8
6.3	2.5	6	2.7	8
6.3	2.5	6	2.7	8
7.6	2.1	4	4.0	90
7	2.3	7	2.3	-
12.5	1.3	3	5.3	307
12.5	1.3	3	5.3	307
40	.4	5	3.2	700
7.5	2.1	8	2.0	(5)

TABLE II

	Number of times land was flooded more than once	Number of acres affected
1969	15	1383
1970	02	64.4
1971	04	NA
1972	25	NA
1973	07	5129
1974	03	2017
1975	02	300
1976	02	80
1977	05	300
1978	04	380
1979	06	NA
1980	10	545
1981	06	712
1982	10	1089
1983	21	7776.4
1984	32	8246.4
1985	01	600

TABLE III

	Crop damage	Hours clean up	Fence repairs	Retiling costs
1973	$941,920	516	NA	NA
1974	193,038	155	NA	NA
1979	26,610	149	NA	NA
1980	NA	NA	NA	NA
1981	$ 94,150	294	$431	$ 500
1982	$640,755	207	$250	$3400
1983	$1,434,845	2972	$4,519	$5854
1984	$1,911,817	3886	$9,964	
	$6,004,462*	11,894*	$41,111*	$40,835*

*Figures above may not add up because some farmers did not specify which years the requested information was from.

TABLE IV

Property taxes paid on flooded lands.

1973	$ 2102
1974	$ 500
1979	$ 1611
1980	NA
1981	$34,719
1982	$42,332
1983	$62,300
1984	$97,419
Total since 1969	$427,969*

TABLE V

Easements amounts paid and year received (total amount received in year.)

1962	$ 8350
1963	$ 13,500
1964	$ 27,200
1965	$232,500
1966	300
1967	$372,450
1968-69	$ 1500
Total	$735,000*

TABLE VI

Solutions	Number of responses	Percent
1. Buy out of affected land	18**	31%**
2. Crop Insurance, subsidies	10	17%
3. Compensation for additional losses	30	52%
4. Other	01	01%

* Fiqures above may not add up because some farmers did not specify which years the requested information was from.

** An additional 6 people stated they would choose to have their land bought out if they could be sure the Corps would give them a "fair" price for their land.

SENATE OFFICE BUILDIN
..TON, DC 20510
224-3744

21 FEDERAL BUILDING
..10 WALNUT STREET
MOINES, IA 50309
..) 284-4890

FEDERAL BUILDING
101 1ST STREET S.E.
CEDAR RAPIDS, IA 52401
(319) 399-2555

United States Senate

CHARLES E. GRASSLEY

103 FEDERAL COURTHOUSE BUILDING
320 6TH STREET
SIOUX CITY, IA 51101
(712) 233-3331

210 WATERLOO BUILDING
531 COMMERCIAL STREET
WATERLOO, IA 50701
(319) 232-6657

116 FEDERAL BUILDING
131 E. 4TH STREET
DAVENPORT, IA 52801
(319) 322-4331

October 28, 1985

William C. Burns, Colonel
District Engineer
Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

Enclosed is a copy of a letter recently received from a constituent of mine concerning the water level of Lake Red Rock.

Mr. Fred Schuster of my Des Moines office, requested in a telephone conversation with Mr. George Wells, the water level be raised 2 msl above your normal 2 msl increase for this time.

The purpose of the additional 2 msl increase is to provide better assistance for the waterfowl habitat. This additional increase is needed because of the lower water level which the Lake had this summer.

I understand the Iowa Conservation Commission had requested the water level be increased to 734 msl, but that a level of 732 msl would be acceptable.

I would appreciate your favorable and timely consideration on this matter and ask that you respond to my Des Moines office. I understand any increase to be temporary and that the 728 msl level would be in place before January 1986.

Sincerely,

Chuck Grassley
Charles E. Grassley
United States Senator

CEG/fs
Enclosure

September 19, 1985

The Honorable Charles E. Grassley
232 Russell Senate Office Bldg.
Washington, D.C. 20510

Dear Senator Grassley:

Enclosed you will find a copy of a letter written by the Iowa Conservation Commission to the Army Corps of Engineers concerning the water level at Lake Red Rock.

My friends and I, all duck hunters, do not understand how the Army Corps can ignore sportsmen's requests year after year. When we ask them to raise the water, they say they can't until the Conservation Commission asks them to. But the Commission gave us a copy of their letter requesting this action. They said the Corps told them that raising the water level to 734 just wasn't in their management plan. We really don't understand why the Army Corps manages its affairs in this manner.

Can you help us straighten this out? The season opens October 26, and Red Rock needs more water.

Sincerely,

Robert Runge

Robert Runge
21 Glenview Drive
Des Moines, IA 50312

RR/sr

Encl.

135 Hart Senate Office Building
Washington, DC 20510
(202) 224-3744

721 Federal Building
210 Walnut Street
Des Moines, IA 50309
(515) 284-4890

206 Federal Building
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131 E. 4th Street
Davenport, IA 52801
(319) 322-4331

November 12, 1985

Colonel William C. Burns
District Engineer
Rock Island District
Clock Tower Building
Rock Island, Illinois 61204-2004

Dear Colonel Burns:

I have received your letter dated November 5, 1985, in response to my earlier letter.

I had inquired into the possibility of raising the water level at Red Rock to at least 732 NGVD. I understand that you do not have final authority in this matter; however, after talking with your national office, they made it clear that if you were to recommend such an increase, such an increase would be approved, unless such an increase would be damaging in ways unknown to them at the time of our discussion.

I ask that you review this matter and make a favorable recommendation to your national office. There is a time element involved in this matter. Such an increase would be only until your normal decrease takes place in December.

Please advise my Des Moines office of your recommendation.

Sincerely,

Chuck Grassley

Charles E. Grassley
United States Senator

CEG/fs/c

301 N. Ankeny Blvd.
Ankeny, Iowa 50021
515-964-2020

CONSULTING ENGINEERS

SNYDER & ASSOCIATES

Civil • Municipal
Water Resources
Computer Services

January 29, 1986

Army Corps of Engineers
Clocktower Building
Rock Island, IL 61201
ATTN: George Wells, NCRPD-R

RE: Redrock Lake Pool Level

Dear Mr. Wells,

As a Councilman with the City of Swan, Iowa, I have been asked by the Mayor and Council to make contact with your department to express the City's concerns and desires regarding raising the permanent pool level on Redrock Lake.

The City of Swan presently has a public water supply well located within the Corps of Engineer, Redrock Lake property. I have included a map indicating this location. The well is not within the present normal pool level of the lake but is subject to periodic inundation at times when flood control occurs within the lake.

This well was installed prior to completion of the Redrock project in the late 60's under an agreement with the Corps of Engineers. The installation was allowed with the provision that the City of Swan be responsible for operation, maintenance and flood protection. This was agreed to by the City under the operation guidelines of the lake that existed at that time.

We understand that your office is presently studying the economic feasibility of instituting a project to raise the normal pool level of Redrock Lake 14 feet above its present elevation. In your study, the City requests that consideration be given to improvements that we feel would be necessary to our well installation as a part of the project.

By raising the normal pool level, the existing operation guidelines will be modified. The frequency of inundation for flood control operations will increase at this site creating an additional burden on the City's budget. In your study, we would wish that one of two alternatives be considered a part of the project.

Army Corps of Engineers
January 29, 1986
Page Two

1. Boulder revetment be placed around the existing well's berm for protection against erosion from the more frequent inundation.

OR

2. Relocation of the well out of the flood control area.

The City's present maintenance of the berm which protects the well has been considerable. We have not been able to incorporate in the City's small budget the revetment protection that is needed and therefore are concerned that more frequent inundation will increase the City's costs to where it may be prohibitive to operate the City's water supply system.

Should you have any questions in review of the City's concern and request, please do not hesitate to contact me at (515) 964-2020 days or (515) 848-5705 evenings. We look forward to hearing your response to our request.

Sincerely,

SNYDER & ASSOCIATES, INC.

Stephen P. Rowe
Engineering Technician
Swan City Councilmen

SPR:sm
Encl.
CC: Larry Walker, Mayor
Virginia Collins, Clerk

1403 W. 13th St. South
Newton, Iowa 50208
March 17, 1986

Colonel William C. Burns
Department of the Army
Corps of Engineers
Rock Island District
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns,

As a member of the Greenbelt Advisory Committee and as an owner of Lake Red Rock Marina, I cannot help but respond with dismay to the to the February STUDY UPDATE of the Alternatives to the Regulation of Lake Red Rock.

The Time Frame paragraph on page 2 indicates an approximate seven (7) years to deal with PL 99-190.

Page 5 indicates that a Supplemental Environmental Impact statement is required by "Purviews of the National Environmental Policy Act" without further explanation of what requires the supplement and what it will deal with.

The final paragraph on page 5 states that "the implementation date for the New Water Control Plan (regulation plan) could be anywhere from 1987 to 2044."

According to my arithmetic and the information projected about the life of Lake Red Rock under present conditions, that would indicate that a decision about the lake level may never be announced?. I wonder if that is an impression that the Rock Island Corps of Engineers intends to make. Hopefully, the suggestion that a decision about the lake level may not be made until the life of the lake is over is, at best, only an unfortunate typographical error.

Much has been going on in the Red Rock Lake area that would indicate that the Greenbelt project has generated hope for economic benefit at last for the area which lost so much taxable land to the "lake". The most unusual happening is a series of meetings of officials and business people from Knoxville and Pella meeting to act as twin-cities with a focus on Lake Red Rock. They have a major event planned for August 2 and 3 with a budget of $5000. That is an achievement!!!

The Red Rock Lake Association is meeting on March 20 to elect new board members and officers to end the depression which came upon the group after the death of its leader, Stu Kuyper. The Greenbelt and the anticipated lake level rise has rejuvenated energy to take advantage of new opportunity.

What a blow to read the February UPDATE!

Sincerely,
Ruth S. Hoover

IOWA CONSERVATION COMMISSION

Larry J. Wilson — Director
Wallace State Office Building, Des Moines, Iowa 50319-0034
515/281-5145

An EQUAL OPPORTUNITY Agency

April 9, 1986

Colonel William C. Burns
District Engineer
U.S. Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Burns:

Members of our Fish and Wildlife Division recently met with members of your environmental planning staff to discuss permanent water levels at Lake Red Rock. At this meeting, we were pleased to learn that you now have the authority to grant temporary water level changes on Lake Red Rock. Please consider this letter as our formal request for a water level increase to elevation 732 msl during the waterfowl migration.

Our wildlife biologists estimate total use of the Red Rock Wildlife Area which we manage to be between 100,000 and 110,000 visitors annually. Approximately 50 percent of this use occurs during the three months of September, October, and November; the same period of time during which the majority of waterfowl migrate through the area. Since Lake Red Rock is located so close to Des Moines, the potential for increasing public use of the area is unlimited.

We recognize that the recreating public is highly attracted to migrating waterfowl. We also recognize that because of its topography, broad floodplain, and location along the Des Moines River, the upper end of Lake Red Rock should be managed primarily as a waterfowl area. To achieve this management goal, we have invested significant funding to develop dikes, levees, water control structures, food plots and refuge areas in an effort to create ideal habitat conditions. Our biggest problem with respect to maximizing habitat conditions on the area is our current inability to control and manipulate water levels on the lake itself. It now appears that you have the authority to provide this necessary management function.

Our request for a water level increase to 732 msl is based on observations over the last two years. At elevations below 732, use of the area by migrating waterfowl and wading birds decreases dramatically. We estimate that if the water level is increased two foot (728 to 730), waterfowl use of the area increases about 60 to 80 percent. However, a four-foot increase (728 to 732) results in a two- to threefold increase in waterfowl use of the area. It

also increases the diversity of species which use the area. Large, vegetated mud flats and silted areas become flooded at elevation 732, creating ideal habitat conditions over a significantly larger area. This flooded area becomes a very significant roosting and feeding area for waterfowl.

Likewise, we have observed a corresponding increase in public use of the area. The following table provides our best estimate of increased use of Lake Red Rock as water levels are increased from the present 728 elevation. These estimates are based on observation, bag checks, and user interviews made by our staff:

Water Level Increase	Percent Increase-Consumptive Use	Percent Increase-Nonconsumptive Use
From 728 to 730	2 - 3 Fold	60 - 100%
From 728 to 732	8 - 10 Fold	1 - 2 Fold

At elevation 728, the area which we manage can support from five to ten hunting parties on the average. Our boat ramp facilities, however, are not usable at this elevation. At elevation 730, the area can support from 15 to 25 hunting parties, but it can cause crowded conditions. Elevation 732 provides maximum public use of the area based on the current lake conditions and silt accumulation. The area can comfortably support 60 to 80 hunting parties and access is available to everyone regardless of the type of equipment used.

Nonconsumptive use of the area increases probably to a lesser degree and is more directly related to the numbers of waterfowl, wading birds and raptors which are using the area. Use of the area is also influenced by the weather and the availability of viewing facilities. Our future plans call for the development of formal observation facilities at Elk Rock State Park and our refuge area located near Swan. We feel these facilities will increase opportunity for people to view wildlife.

To summarize, a four-foot water level increase to 732 during the fall months provide optimum habitat conditions and the greatest potential for attracting large numbers of migrating birds and waterfowl. Large wildlife populations, of course, attract large numbers of users. These users range from organized sportsmen's groups and Ducks Unlimited Chapters to the small informal interpretive sessions given by Gladys Black. Boaters, sightseers and those people interested in the aesthetic value of Lake Red Rock would also be supportive of the proposed raise.

The waterfowl migration to the Lake Red Rock area occurs primarily from September through December. It is at this time that we are requesting the water level raised to 732 msl.

We hope that you will consider waterfowl management to be an important

function of Lake Red Rock and take the necessary steps to initiate our recommended water level increase.

Sincerely,

LARRY J. WILSON, DIRECTOR
IOWA CONSERVATION COMMISSION

rlt:L26

cc: Ducks Unlimited Chapters - Des Moines,
  Knoxville, Indianola, Cedar Rapids, Ankeny
  Izaak Walton League - Des Moines, Cedar Rapids, Newton
  Sportsmen's Group List - Central Iowa
  Sierra Club - Des Moines
  Audubon Club - Des Moines
  Gladys Black
  Local C.O.E. Rangers

TOM HARKIN
IOWA

(202) 224-3254
TTY (202) 225-1904
COMMITTEES
AGRICULTURE
APPROPRIAT
SMALL BUSINESS

United States Senate
WASHINGTON, DC 20510

June 23, 1986

George Wells
Planning Division
U.S. Army Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Mr. Wells:

Enclosed is a copy of a letter I received from a constituent who received the February 1986 update on the Red Rock easement situation. They express concern that seven years is a long time to complete the study and will not help those, who like them, are in their seventies.

I would appreciate your response to their concerns as well as any information you could provide Mr. and Mrs. Harold Williams which would give them an opportunity to recoup on the damages to their property from flooding at Lake Red Rock.

Thank you in advance for your response. Please direct your correspondence on this to me at my office in Des Moines.

Sincerely,

Tom Harkin
Tom Harkin
United States Senator

TH:dl
Enclosure

Dallas, Ia.
Mar 7, 1986

Honorable Tom Harkin
United States Senator

Dear Sir:

We had a study update on the regulation of Lake Red Rock dated February 1986. It tells us it will be seven years before we will know what to expect for damages of the easement land.

This seems like a long time for an answer. People like us, who are in their seventies, are the ones it has damaged and in that period of time will have either lost our farms, or not here to farm any more.

Can't we have any [illegible] adjustment?

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

November 14, 1986

Mr. Richard C. Nelson
Field Supervisor
U.S. Department of Interior
Fish and Wildlife Service
Rock Island Field Office (ES)
1830 Second Avenue, Second Floor
Rock Island, Illinois 61201

Dear Mr. Nelson:

I would like to thank you for the opportunity to comment on the draft Fish and Wildlife Coordination Act report evaluating the alternatives to the regulation of Lake Red Rock on the Des Moines River, Marion County, Iowa. The report clearly and accurately identifies alternatives, impacts, and mitigative measures on habitat as well as recreation facilities at various reservoir pool levels, particularly notable are Tables 1, 3, and 4. The Iowa Department of Natural Resources does, however, feel that Alternative 2, that is the immediate raise to pool reservoir level 742, is the best option. From your evaluation in the tables noted, you can see that the benefits are high to medium for most improvements to fish and wildlife habitat at this option and most recreation facilities at the upper end of the reservoir would be satisfactory. However, some recreation facilities, particularly east of the Highway 14 bridge, would have to be rebuilt. Also, proposals to improve fish and wildlife recreation access in Table 4 are of moderate to high value at this option. The Iowa Department of Natural Resources recognizes that this alternative would cause the loss of approximately 10,000 acres of land. It is the position of the Iowa Department of Natural Resources that this alternative is acceptable only if the easement lands are acquired in fee title and included in the Iowa Department of Natural Resources fish and wildlife management license. The option of raising the reservoir pool level to 742 and acquiring the easement lands would provide the broadest range of benefits to fish and wildlife resources. The acquisition of the easement lands would compensate for the loss of wildlife habitat in the elevated pool and make additional lands available for wildlife management and public recreation. Also, with the Condition 5 funds derived from cropping of such lands, facilities such as dikes and water control structures for increased wildlife management could be created. The pool raised to 742 would also be the most beneficial to the fisheries resource of the reservoir.

Sincerely,

Wilson

LARRY J. WILSON, DIRECTOR
DEPARTMENT OF NATURAL RESOURCES

STATE OF IOWA
TERRY E. BRANSTAD, GOVERNOR
DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

December 11, 1986

Ms. Gail Cormody
Fish and Wildlife Service
Rock Island Field Office (ES)
1830 Second Avenue
Rock Island, Illinois 61201

Dear Ms. Cormody:

Thank you for inviting our comments about the proposed water level change at Red Rock Reservoir. I have conducted a search of maps and computer records for the project area, and our staff has reviewed the findings.

At this time, we are aware of several records of protected species and significant natural features within the project area. These are recorded on the enclosed list. Several records are close to the reservoir or within or immediately adjacent to the Des Moines River downstream of the reservoir. Of the occurrences near the reservoir, all are well above the proposed water level. Occurrences below the dam are unlikely to be affected except by a severe flood or low flow condition.

Please note that lack of additional records in the Iowa Natural Areas Inventory data base does not mean that other significant plants or animals are absent from the area. Our information is not the result of comprehensive field surveys and should not be considered a substitute for on-site investigations.

If you have any questions about this data or would like further details, please call me.

Sincerely,

JOHN FLECKENSTEIN
DATA MANAGER
PRESERVES AND ECOLOGICAL SERVICES

JF:rlt:L82

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145

RARE SPECIES AND NATURAL COMMUNITIES [illegible] NEAR RED [illegible] AND ALONG THE DES MOINES RIVER DOWNSTREAM FROM RED ROCK DAM

ELEMENT NAME	LOCATION	INVENTORY# RANK	LEGAL* STATUS	YEAR LAST SEEN
Western sand darter	T72N R13W Sec. 31	S2	T	1984
Smallmouth salamander	T77N R21W Sec. 36	S3	-	1972
Eastern hognose snake	T76N R19W Sec. 7	S3	-	1982
Graham's crawfish snake	T72N R14W Sec. 19	S4	-	1943
Copperhead	T69N R 9W Sec. 34	S1	E	1942
Yellow-crowned night heron	T78N R22W Sec. 35	S2	-	1977
Yellow-throated warbler	T65N R 6W Sec. 14	S3	-	1979
Keen's myotis	T76N R18W Sec. 18 T76N R18W Sec. 17	S3	-	1981 1979
Indiana Bat	T75N R18W Sec. 11 T76N R18W Sec. 18 T76N R18W Sec. 30	S1	E	1977 1980 1979
Evening bat	T75N R18W Sec. 11 T76N R18W Sec. 18	S3	-	1977 1980
Woodland vole	T72N R14W Sec. 19	S2	T	1914
Southern bog lemming	T75N R17W Hillsboro Area	S3	-	1966 1900
Cottonwood	T77N R23W Sec. 21	S1	-	1957
Pawpaw	T69N R 9W Sec. 34	S3S4	-	1954
Ginseng	T76N R20W Sec. 3	S3S4	-	1952
Blackhaw	T67N R 8W Sec. 2	S2S3	-	1953
Pink milkwort	T76N R19W Sec. 5	S1	E	1962
Clustered sedge	T76N R18W Sec. 30	S1	E	1957
Yellow trout lily	T76N R18W Sec. 18 T76N R19W Sec. 15 T76N R19W Sec. 5	S2	E	1981 1978 1980
False hellebore	T68N R 8W Sec. 15	S2	T	1953
Sand barren	T76N R20W Sec. 2	S5	-	1982
Floodplain marsh	T74N R16W Sec. 4 T75N R17W Sec. 35	S4	-	1980 1980
Floodplain lake	T75N R17W Sec. 28	SU	-	1980

Assigned by the Natural Areas Inventory and dependent largely on the number of sites from which an element is known:
- S1 1-5 sites known in Iowa
- S2 6-20 sites known
- S3 21-100 sites known
- S4 Probably secure in Iowa
- S5 Secure in Iowa
- SU Number of sites unknown

* Assigned by the state ecologist and the Legislature, reflects degree of legal protection:
- E Endangered
- T Threatened
- \- No additional legal protection

ATE OFFICE BUILDING
N, DC 20510
24-3744

FEDERAL BUILDING
ALNUT STREET
DES MOINES, IA 50309
(515) 284-4890

206 FEDERAL BUILDING
101 1ST STREET S.E.
CEDAR RAPIDS, IA 52401
(319) 399-2555

United States Senate

CHARLES E. GRASSLEY

103 FEDERAL COURTHOUSE BUILDING
320 6TH STREET
SIOUX CITY, IA 51101
(712) 233-3331

210 WATERLOO BUILDING
531 COMMERCIAL STREET
WATERLOO, IA 50701
(319) 232-6657

116 FEDERAL BUILDING
131 E. 4TH STREET
DAVENPORT, IA 52801
(319) 322-4331

February 13, 1987

Colonel Neil Smart
U.S. Army Engineering Dist., Rock Island
Post Office Box 2004
Clock Tower Building
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

Enclosed is a copy of a letter received from a constituent of mine, Mr. Bob Wilkins. I beleive you will find the letter self-explanatory.

I would appreciate it if you would look into the possibilities of dredging Red Rock Lake and advise me so that I may respond to Mr. Wilkins.

Please respond to my office in Des Moines.

Sincerely,

Chuck Grassley

CHARLES E. GRASSLEY
United States Senator

CEG/fs
Enclosure

(I BELIEVE IN RECYCLING EVERYTHING!)

1987 FEB -6 AM 4: 15

621 Douglas, Des Moines,
Iowa, 50313. ~~11-14-86~~
1-28-87

Senator Charles Grassley: ATT: Fred Schuster, Des Moines Office

I had written you about this subject of dredging Redrock lake and had received your letter declining the idea Jan 21, 86.

I have done more thinking and some research on the matter, and have an idea that the reason for rejecting the plan would bear looking into, along with the plan itself.

In your letter you suggested I call your Des Moines office and talk with Fred Schuster about it. . .which I did. He suggested I send the idea in again, and you can make a formal inquiry of the Army Engineers or whoever's involved, and I will take it from there.

Ecologically and philosophically dredging fills the bill. It ought to be cost effective if figured on a long term of years, which it certainly should be. The reasons are obvious: the advantage of keeping the lake the size originally planned is much less expensive and destructive and disruptive than trying to relocate the paramater facilities every time the lake has to be enlarged, which would be automatically recurring, of course. Also the acres feasibly reachable would benefit by the return and spreading of the dredged silt. etc.,etc.

I admit this is not very high priority these days. I also admit that I would rather have you spending your time rejecting the salary raise for top governmental workers, and restoring some sanity in reducing military compared to CONSTRUCTIVE expenditures. . . . but. . .

Sincerely,

Bob Wilkins

Bob Wilkins

Leonard A. Waldorf
400 34th Street
West Des Moines, IA 50265

Dudley M. Hanson, P.E.
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building -- P.O. Box 2004
Rock Island, IL 61204-2004

March 18, 1987

Dear Mr. Hanson:

I look forward to the opening scene. Dan Rather standing on the mile-long bridge with Red Rock Dam off in the distance and the huge expanse of Red Rock Mud Flats in between. Mr. Rather: "This used to be a lake. A lake built by the U.S. Army Corps of Engineers and paid for by you, the U.S. Taxpayer. Although the lake was planned so that the water level would rise gradually to cover anticipated siltation for the next 100 years, you can see behind me that this has not happened. Instead, the Corps is bogged down in a bureaucratic quagmire of environmental impact statements, public hearings, and closed-door politicking that has become a death sentence for Lake Red Rock. This is Dan Rather and I'll be back in a minute with 'Who Killed Lake Red Rock'."

I think it is great that the Corps is studying the situation at Red Rock to come up with the best long-term solutions to the problems. But I think that it is ridiculous to abandon the original plan and allow the lake to become an unusable eyesore before a new plan can be developed. I believe there are many others who will agree with me. Please cover the mud at Red Rock now. Then get back to planning for the future.

Respectfully,

Leonard A. Waldorf

Leonard A. Waldorf

May 17, 1987

Colonel Neil Smart, Commander
Rock Island District Corp of Engineers
Department of the Army
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Smart:

One of the great joys of our family's residency in Iowa has been the many hours of recreational pleasure we have had sailing on Lake Red Rock. We often bring guests to the lake to share this unique resource with us. Our Lake Red Rock Yatch Club has provided sailing parties for organizations such as Big Brother Big Sister so that others could enjoy the fun and excitement of this picturesque lake. We have watched hundreds of people on the water and in the surrounding recreational areas share in the sparkling beauty and freshness that this facility provides. Out of state visitors often express their amazement that Iowa has such a unique recreational water system. Red Rock and its sister lakes are among the best features that contribute to the quality of life to be found in our state.

The problems associated with maintaining the optimum water level of Lake Red Rock concern us all. Those of us who are active on the lake are aware that there is a complex system of relationships that effect the interests of more than any one group. Responsible resource management must be senstive to in the best of interests of all concerned.

We boaters are concerned that the lake remain optimally navigable for recreational use. Those of us with keel boats are having some difficulty getting our boats on the water this spring. One such effort this season ended in failure to launch and in damage to trailer equipment. We understand this family simply adandoned the lake and went somewhere else to sail. Another sailing family had difficulty finding a channel of sufficient depth to get out of the dock area and onto the lake.

We urge the Corps of Engineers to act now and raise the water level of the lake at least two feet this spring and to dredge the launching area and channel so that we may use our boats to the fullest extent this season. We urge you to adopt your option for the progressive raising of water level over the next few years to assure maximum use of this recreational resource in the years to come.

Sincerely,

Louis J. Wolter

UNITED STATES DEPARTMENT OF AGRICULTURE | SOIL CONSERVATION SERVICE | 104 S. 6TH ST. KNOXVILLE, IA 50138

18 May 87

Mr. Dudley M. Hanson, P.E.
Dept. of the Army
Rock Island District Corps of Engineers
Clock Tower Building-P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Hanson:

Enclosed is the completed AD-1006 form. Since there is no prime farmland, I have completed all the parts which apply to this situation.

If you have any questions, I can be reached at 515-842-5314.

Sincerely,

Terri Skadeland

Terri Skadeland
District Conservationist

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 4 May 87
Name Of Project LAKE RED ROCK	Federal Agency Involved U.S. Army Corps of Engineers
Proposed Land Use Enlarged Conservation Pool	County And State Marion, Iowa
PART II *(To be completed by SCS)*	Date Request Received By SCS 18 May 1987

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply – do not complete additional parts of this form).*	Yes ☐ No ☒	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined in FPPA Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By SCS	

	Maximum Points	Alternative Site Rating Site A	Site B	Site C	Site D
PART III *(To be completed by Federal Agency)*					
A. Total Acres To Be Converted Directly (Ag. Leases)		2,500			
B. Total Acres To Be Converted Indirectly (AccessLoss)		900			
C. Total Acres In Site (Federal Fee Lands)		47,610			
PART IV *(To be completed by SCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland					
B. Total Acres Statewide And Local Important Farmland					
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted					
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value					
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*					
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160				
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100				
Total Site Assessment *(From Part VI above or a local site assessment)*	160				
TOTAL POINTS *(Total of above 2 lines)*	260				

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

State Historical Society of Iowa
The Historical Division of the Department of Cultural Affairs

October 22, 1987

Dudley M. Hanson, P.E.
Chief, Planning Division
U.S. District Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

RE: ARCHAEOLOGICAL TESTING, NRHP ELIGIBILITY DETERMINATION AND IMPACT ASSESSMENT, LAKE RED ROCK, IOWA: POOL RAISE PROJECT. (DACW25-87-C-0016). DRAFT REPORT.

Dear Mr. Hanson:

I have completed our review of the above referenced project based on the report of Phase II investigations conducted by the American Resources Group. Minor comments of an editoral nature are attached to this letter. In general, the draft report meets the Scope of Work and we recommend acceptance. The principal points to address in final copy is the integration of the prehistoric and histoirc anaylsis. The two segments are obviously prepared by two authors using different terminologies, typologies, and writing styles. While each does stand alone as an acceptable product, the reader would be better served by a more integrated document.

We concur with ARG that the following archeological sites are considered ineligible for listing on the National Register of Historic Places: 13MA32, 42, 84, 216, 223, 246, 261, 263, 264, 266 (prehistoric), 282, 286, 298, 299, 318, 321, 322, 324 (historic), 329, 330, 341, 342, 344, 345, 354, 356, 358, 366, 367, 370, 371, 372, 378, 382, 386, 389, 392, 393, 3[illegible]3, 399, 404, 415, 425, 432, 435, 438, 440, 445, 446, 449, 453, [illegible]54, 456, 458, and 459.

Sites 13MA207 and 13MA208, Oneota temporary base camps with intact subplowzone deposits; 13MA324-Locus A, an Archaic/Late Woodland "bivouac" with intact subplowzone deposits; 13MA266, a 19th century subsistence farmstead; 13MA385, a Late Woodland "bivouac" with intact deposits; 13MA347, historic townsite of Perry; and 13MA449, historic town site of Dunreath, have the

☐ 402 Iowa Avenue
Iowa City, Iowa 52240
(319) 335-3916

☑ Capitol Complex
Des Moines, Iowa 50319
(515) 281-5111

☐ Montauk
Box 372
Clermont, Iowa 52135
(319) 423-7173

potential to yield significant information on the prehistoric and historic occupations of the Red Rock area and are considered eligible for the National Register of Historic Places. If you concur with our opinion, these seven sites will be considered eligible for Section 106 purposes. Should you disagree with our opinion, you should seek a Determination of Eligibility from the Keeper of the National Register.

Because these archeological sites are considered eligible for the National Register and the COE proposed annual 2 ft fall raise and continued flood pool raises will promote the processes of erosion and redeposition impacting the sites, the project must be reviewed in accordance with the requirements of 36 CFR Part 800.9(c). The pool raise will clearly have an adverse effect on the sites . However, when a historic property is of value for its potential contribution to archeological research and the value can be preserved through the conduct of an appropriate data recovery program, the effect of the undertaking shall be considered as being not adverse.

Therefore, if you agree to provide us with final plans and specifications for the pool raise prior to construction and a proposed data recovery plan for the seven sites, we would concur with a finding of conditional no adverse effect as defined in 36 CFR Part 800.9.

You should include a copy of this letter with your documented finding to the Advisory Council on Historic Preservation as specified in 36 CFR 800.6 and described in 800.8(a).

If you have any questions, please do not hesitate to contact me.

Sincerely,

Kay Simpson

Kay Simpson
Archeological Survey Program
Bureau of Historic Preservation

cc: Ron Anzalone, ACHP
J. Paul Van Hoorebeke, COR

208 Wellons
Ames, Iowa 50010
October 31, 1987

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P. O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sir

I am extremely disappointed in your lack of cooperation with the Iowa Department of Natural Resources concerning Fall water levels at Lake Red Rock. Your present level of 730.3 is a good example of this. This level makes the upper end of the lake much less attractive to migratory waterfowl and much less usable to waterfowl hunters. You have an opportunity to provide thousands of hours of quality recreation time to hundreds of people at no cost by raising the level to 732.0.

If this raise was accomplished at this time, crop harvest, which is nearly complete, would be virtually unaffected. At the present level of 730, large mud flats exist between emergent vegetation and the water making it unattractive to waterfowl. Also at the present level, large areas of the lake above Highway 14 are unnavigable and also unwadable due to the extremely soft bottom.

I am in favor of the three-step pool raise of elevation of 732, 736, and 742. However, I feel the Department of Natural Resources should be given more control of water levels, especially in the Fall, so as to provide the best possible habitat for waterfowl.

Sincerely

Douglas L. White

Douglas L. White

DLW/bkw

KNOXVILLE COMMUNITY SCHOOL DISTRICT

MIDDLE SCHOOL
306 South Park Lane Dr.
KNOXVILLE, IOWA 50138

November 2, 1987

District Engineer
U. S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P. O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sir:

Thank you for keeping me informed on the progress of plans for Lake Red Rock, Iowa. I have appreciated the opportunity to receive the written updates as well as attending the public meetings.

I realize that in a project of this size and nature it is impossible to make everyone happy; however after studying your proposals, I think you are moving in the right direction for this area. I am especially pleased about the identifying and study of Historic sites. The preservation of our heritage depends on such activities.

Thank you again,

Clyde E. Prichard

Clyde E. Prichard
Principal

NORFOLK SOUTHERN

Norfolk Southern Corporation
99 Spring Street, S.W.
Atlanta, Georgia 30303
404 529-1463

G. E. Drake
Chief Engineer
Design & Construction

November 3, 1987

In reply, please
refer to file:
204-242 RCS/sbj

Subject: Runnells, Iowa - Lake Red Rock Railroad Relocation Project - Draft Water Control Plan - Proposal to increase conservation pool 14 feet to elevation 742 over the next 10 years.

Colonel Neil A. Smart
District Engineer
U. S. Army Engineer District
Rock Island
Attn: Planning Division
Clock Tower Building - P. O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

Please refer to the Draft Water Control Plan sent to us with Mr. Hanson's letter of July 21, 1987, to Mr. H. T. Paton of the U.S.DOT. Upon reviewing the plan, this is to advise that we do not feel raising the conservation pool by 14 feet will adversely affect trackage owned and maintained by NS. However, since we have trackage rights on the Burlington Northern between Harvey and Swan, we share their concerns about the effects on their trackage. It would be appreicated if you would keep us informed about the progression of this project.

Yours very truly,

GE Drake

G. E. Drake

Copy: H. T. Paton
J. A. Leeper
D. L. Boger

Mr. Dudley M. Hanson, District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island Illinois 61204-2004

November 5th, 1987

Dear Dudley:

What happened? Your own engineers spent two years studying the situation at Red Rock Lake and now you are not going to follow their recommendations. Can't you say more than public and agency concerns are changing your mind? Were there environmental or engineering problems with the recommendations that your engineers failed to notice? Do these public and agency people possess more thorough training in operating a flood control project?

I have a copy of a several-hundred-page report telling me that your latest decision is wrong. Unless you can release additional information to convince me otherwise, I still favor raising the lake level at least 8 feet immediately and to 742 feet as soon as practical.

Respectfully yours,

MARTIN L. JOHNSON

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

November 5th, 1987

Sirs:

It is obvious from your Project Report Update for Draft Water Control Plan with Draft Supplemental Environmental Impact Statement, Lake Red Rock, Iowa dated October 28th, 1987 that after careful consideration, study, and review, you have made a snap political decision not based at all on the facts so well documented in the Draft Water Control Plan itself.

To now announce a plan that will barely cover the mudflats in the lake shows at least a lack of thorough investigation and at worst a total disregard for the safety of the citizens of Iowa. Your revised plan would give the appearance of a lake where danger for waterskiers, fishermen, duck hunters, and recreational boaters lurks just a foot or so beneath the surface. Iowans deserve better than that.

Then of course is the fact that the mudflats along with the stench they release into the air after a period of high water will return in just a few short years and you will have the problem to face all over again. That will mean another study, another Environmental Impact Statement, more public meetings, and in all probability another political decision. What a waste of time! Of course it does give some job security to some civil engineers for the next few years.

To reach this last-minute decision after all of the best minds, all of the man-hours of study and research, and all logic pointed to the decision disclosed in your draft plan, you must feel that your professional ethics have been compromised. As a taxpayer, I would like to have my share of the money that has been wasted on a two-year study, the results of which will now largely be ignored.

Lake Red Rock was designed for a permanent pool with an elevation of 742 feet NGVD for flood control, low-water augmentation, and recreation. That is the level for which it was designed and that is the level at which it provides the best results for its stated purposes. Your decision to maintain a lower level is a mistake.

Sincerely,

John [illegible]
3121 Sunset
Ames, Ia 50010

District Engineer
Mr. George Gitter
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

November 5th, 1987

Dear Mr. Gitter:

The project report update dated October 28, 1987 in reference to Lake Red Rock's Water Control Plan doesn't make any sense. It purports to contradict in a 3 1/2 page letter all of the study efforts covering several years and hundreds of pages of documentation. The new level proposed will barely cover the mud for a couple of years and will even be dangerous to boaters and water skiers using the lake. Please count me in favor of the original draft report - raise the level now to 736 and later to 742.

Sincerely,

Mary Lynn Rue
909 S 7 Ave W
Newton, Iowa 50208

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

November 8th, 1987

Dear Sirs:

When the draft report on Lake Red Rock was released, I was disappointed that the study indicated a level of 736 feet NGVD was best for now since I had been hoping for 742. I suspected that politics may have played a part in the decision, but the explanations at the public meeting convinced me otherwise. Now I am sure politics are involved.

You really don't need me to tell you that 734 is wrong -- you already know it. Your extensive report proves it. Your public meetings explained it. The only question I have is why you gave in to the complaints of a few farmers over the objections of the governor who has expressed his opinion that Red Rock should be raised to 742 feet NGVD.

A level of 734 is not an acceptable compromise. The shallow waters over the siltation under the bridge will be unsafe and the siltation will again be above water too soon. I support an immediate raise to 736 and a further raise to 742 as soon as possible.

Respectfully yours,

909 S. 7th Ave W
Newton, Ia 50208

PS. why weren't those recreational boaters and other users who sent in post cards added to the mailing list for this last mailing. They are just as interested as those few outspoken Farmers. Also the bottom land around that lake should not be planted during a time when Farmers are being paid not to plant good land. Iowa needs recreation

City of Knoxville, Iowa 50138-2287

305 S. Third • Telephone 515/842-3146 or 515/842-3147

November 9, 1987

Dudley M. Hanson, P.E.
Department of the Army
Rock Island District, Corps of Engineers
P.O. Box 2004 - Clock Tower Building
Rock Island, Ill. 61204-2004

Dear Mr. Hanson: Re: Lake Red Rock

This is in response to your letter of October 28, 1987 regarding the alternatives to the level of Lake Red Rock.

I would like to go on record of supporting your alternatives of 736 feet and 742 feet, rather than the 734 feet and 742 feet. I believe the new alternative could be dangerous to users of the lake. Lowering the level two feet would place the recreation user closer to submerged areas and items without greately increasing the area of agricultural production.

I also believe the proposed change would restrict recreational use of the area considerably, something Iowa can't afford due to our limited water born recreational opportunities.

I trust that your office will consider these comments in your consideration of what alternative you select. Thank you in advance for your consideration of my comments and if you have any questions please contact me.

Respectfully submitted,

Richard D. Franc
City Manager

RDF/cg

Goff-Nash

10 E. Main
Knoxville, Iowa 50138
515-842-3121

1/11

District Engineer
U.S. Army Engineer District, Rock Island
Attn. Planning Division

Dear Sir,

I am writing to encourage you to keep the level of Lake Red Rock at the 736 ft elevation. At the 734 ft level, a boating hazzard will exist over old Hwy 14. In addition to this, the aesthetic effect on the upper lake would be greatly improved. I feel it would greatly improve the net economic impact to the area with increased tourism and visitor usage.

Thank you for your consideration

Sincerely

Bill Goff

NAPA

Knoxville, Iowa
November 11, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

Gentlemen:

I was disappointed to hear of your recent proposal to reduce the raising of Lake Red Rock from 736 to only 734.

I feel that a level of only 734 would have a negative impact on the area both economically and aesthetically. It reduces the potential of the area for tourism significantly.

Particularly I feel that an elevation of only 734 would:

1.) create a definite boating hazard at old highway 14

2.) reduce the potential size of the lake by 2500 acres as compared to the 736 level

3.) Reduce the aesthetic qualities of the lake. The mud flats would still be partially visible. (80% of the people get their first impression of the lake from Highway 14.

4.) There would be no operational advantages by a reduced level of 734.

5.) There is no cost advantage on ramps and facilities around the lake at 734. They are constructed to handle 742.

Finally, I feel the Corp. needs to consider the net economic impact on the area and make their decision to enhance the economic potential without affecting flood control. A higher elevation would do this.

Please reconsider and raise the lake to the original proposed level of 736.

Thank you,

D W Scheidt

Dennis W. Scheidt
RR #3
Knoxville, Iowa 501:

DWS/ps

District Engineer, U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

November 11th, 1987

Gentlemen:

I am in receipt of your Project Report Update for Draft Water Control Plan with Draft Supplemental Environmental Impact Statement, Lake Red Rock, Iowa dated October 28th, 1987. I have several objections.

1. I have spoken with a dozen or so individuals who did attend the public meeting in Pella, Iowa on July 7, 1987 and who did provide written comments on the draft report who have not as of this date received the aforementioned letter.

2. After spending thousands of taxpayers' dollars and man-years of experts' time studying Lake Red Rock, you are now planning to ignore the conclusions of the study without documented reasons.

3. The proposed lake level of 734 feet NGVD was not even considered in the comprehensive study of alternatives.

4. The proposed lake level will present a clear danger to those using the lake. According to the draft report, a level of 734 feet NGVD would place the remains of old highway 14 approximately one (1) foot below the surface of the water. Given the corps' poor record of maintaining aids to navigation on the lake, accidental groundings are a certainty.

5. Current regulations dictate that any future raises in lake level will only be permitted after more environmental impact statements and public meetings, all at great expense. A pool raise to 742 feet NGVD now would save all of that expense. A pool raise to only 734 feet NGVD would require that another raise be considered much sooner than your proposed raise to 736 NGVD. Economically, your recommendation of 736 feet NGVD made more sense.

6. Construction has already begun on several improvements to facilities surrounding the lake based on your proposed level of 736 feet NGVD. The state's new boat ramp will look pretty silly starting just above the water's edge.

7. The possibility of a lawsuit for misuse of public funds and mismanagement of the lake because the study is being ignored threatens to drive the cost to the corps even higher.

Through your study, you proved that Lake Red Rock should be raised to a level of 736 feet NGVD. I favor 742; some favor 728. I would think that you would show faith in your study and stick with 736.

Sincerely,

Leonard A. Waldorf

November 13, 1987

U.S. Corps of Engineers
Planning Division
Clock Tower Bldg.
P.O. 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

On July 13, 1987 I wrote you a letter concerning my thoughts on raising the water level at Lake Red Rock to the 742 level. I've read an article concerning your proposed plans to raise the level of the Lake up to the 734 level. I would commend you for making plans to raise the level of the Lake but would ask that you consider plan 3 in the proposals that were submitted to the general public during the July time frame. In this plan, the water level of the Lake would be raised to the 742 level over a four year period. I still feel that is the plan that would be most appropriate for the Lake area.

Thank you again for the opportunity to express my concerns on Lake Red Rock.

Sincerely,

Don H. Long

Don H. Long
Adminstrator-Public Affairs

November 13, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building-P.O. Box 2004
Rock Island, Ill. 61204-2004

Dear Sir:

I am writing concerning the recommendation by the Corp of Engineers to reduce the proposed level of the Lake Red Rock, from 736 ft to 734 ft NCVD. This would be an unwise decision for the following reasons:

1. It reduces the size of the water surface by 2,500 acres.

2. It creates a serious hazard at old Highway 14, for boating traffic.

3. It reduces the coverage of the mud flats near Highway 14. This is the one area of the lake that needs to have a more positive aesthetic image-80% of the visitors get their first impression from this view.

4. Raising the lake to 736 ft. or above, does not appreciably change the operation of the lake. (The work that has been done was assuming elevation 7.42 in. in most instances.

Other than appeasing a minority of very vociferous upstream land owners, it would appear the decision to reduce the proposed elevation to 734 has little merit. As a taxpayer, I sincerely request you give greater consideration to the economic potential for the counties, municipalities, and state in providing a larger, deeper, safer and more attractive body of water. This can be accomplished without hampering flood controls, or harming the farming interest that have been negative to a raise.

Thank you for your consideration.

Sincerely,

Will Prather

Willard I. Prather

November 13, 1987

District Engineer
U. S. Army Engineer District Rock Island
Attn: Planning Division
Clock Tower Bldg.
P O Box 2004
Rock Island, Illinois 61204-2004

Gentlemen:

I recently read an article in the Des Moines Register concerning the Corp of Engineers position on a proposal to raise the level of Lake Red Rock to a 734 elevation rather than the earlier proposed 736 level. I am well aware of the pressure and comments your group has received from local agricultural interests endorsing the 734 elevation level so as to provide additional agricultural ground. I have been involved in the agricultural credit area for approximately 15 years and based upon the over abundant supply of grain and surplus agricultural capacity, I do not understand why additional ground is needed. In fact, the United States Government is currently providing outright cash payments to certain agricultural producers so as to not produce additional grain to further accentuate the problem.

I have been involved with a group who has tried to promote industrial development in our area for approximately three years. One of the ways we use to attract new industry to our area is to accentuate the recreational opportunities provided by Lake Red Rock. I personally feel the higher 736 elevation level would provide significantly greater recreational opportunities as well as improve the overall aesthetic appeal of the entire area. As I understand the situation the lake was originally constructed to handle a 742 elevation level and there would be no significant increase in cost to the Corp to maintain the lake at the 736 level. I would like your group to consider the overall economic benefits which maybe derived by our community because of the improved recreational opportunities provided by a higher lake level. I also feel the overall aesthetic appeal would be significantly enhanced by raising the lake to the 736 level. These particular economic advantages of the higher level far out weight the interest of a select few who require additional farm ground in these depressed agricultural times. Thank you very much for your consideration of this matter.

Very truly yours,

Robert C. Wims

Robert C. Wims

McKAY-FEE INSURANCE AGENCY

111 E. MARION STREET
KNOXVILLE, IOWA 50138

GRAHAM FEE, CIC
DANIEL T. McKAY, CIC

AREA CODE 515
PHONE 842-2135

MICHAEL K. McKAY
JOHN E. FEE

November 14, 1987

District Engineer
U. S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Buiilding - P. O. Box 2004
Rock Island, Illinois 61204-2004

Regarding: Red Rock Lake - Pool Level

Dear Sir:

I am writing to you to encourage you to consider raising the permanent pool level of the Red Rock Lake from the current 728 fott level to a level of 736 feet. I ask for this level raise based on several points.

First, the proposed increase to 734 feet will pose serious threats to boating on Lake Red Rock. In my experience in the insurance business we have noted that the nimber and severity of loss to property and person have declined over the years except when water levels rise to 730 to 734 feet. At this level many structures become submerged just below the water level. Due to the muddy condition of the lake the obstructions cannot be seen. In the matter of safety please raise the leve to 736 feet to avoid the boating accidents that we have seen and the needless loss of property and personal injury. The level at 736 would sufficiently cover fixed obstacles in the lake to make navigation safe for the recreational user of the lake.

Second, ones first impression is often gained from the view of Lkae Red Rock while crossing the bridge on Iowa Hiway 14. What one currently sees is a sea of mud and silt bottoms. This is not only unsightly it is severly restricting the flood water holding capabilities of the Lake. A rise to 736 feet would eliminate the mud flates and allow for a more pleasing appearance to those travelling by our Lake. I was the Chairman of the annual bike ride around the lake, the overwhelming comment of the riders was how beautiful the area around the dam was and how ugly it was as you rode over Hiway 14.

McKAY-FEE INSURANCE AGENCY

111 E. MARION STREET
KNOXVILLE, IOWA 50138

GRAHAM FEE, CIC
DANIEL T. McKAY, CIC

AREA CODE 515
PHONE 842-2135

MICHAEL K. McKAY
JOHN E. FEE

Finally, there seems to be no apparent reason for raising the level to 734 as it would not increase the pool for holding flood waters by a significant amount ove the 736 level, the infra structure of ramps and parks would be undamaged by the raise as it seems that all facilities and ramps are efficient to a level of 742.

I understand that a number of rather loud farm related interests were the reason for the reduction in the increase to 734. It would seem that the farm interest is the major cause of our problem at Lake Red Rock. The inability to properly manage the land that is now cultivated to reduce or avoid soil runoff has contributed greatly to the current problems at Lake Red Rock. I would suggest that the farm interest manage its' affairs and allow the damage that has already been done to be fixed.

Thank you for your consideration of my views and will await to hear your final decision on the lake level. I am in hopes that you will see the wisdom of raising the level to the previosly proposed level of 736 feet.

Best regards,

Dan McKay

J. R. ASHTON, D. D. S.
112 N. 2ND BOX 396
KNOXVILLE, IOWA 50138

HOURS BY
APPOINTMENT ONLY

OFFICE PHONE 828-8778
RES. PHONE 842-4453

11-15-87

Dear Sir -

I have attended several meetings in regard to the "lake-level" of Red Rock

I am in favor of the 736 level at this time. In my opinion it would be the thing to do

Thanks

Dr J R Ashton

FIRST FINANCIAL BANK
106 E. Main
Knoxville, Iowa 50138
(515) 842-5941

November 16, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

I'm writing to express my concern and disappointment in the fact that the Corps of Engineers has changed the recommendation to raise the proposed lake level from 736 to 734.

While a two foot reduction in the size of the lake sounds small, the information I have read indicates that this two foot reduction will reduce the size of the lake by 2500 acres. This has tremendous affect on the appearance of the lake from the area around Highway 14 and the Mile Long Bridge. The appearance presently of the lake from that view is that of a mud flat.

I think it is important that the lake be raised to the 736 level so that people viewing the lake, many for the first time, can see the potential for the recreation and boating. I feel that by raising the lake to the 736 level would not affect the ramp facilities around the lake, as they were constructed to handle a level up to 742 feet. I can't see how it could affect the operation of the lake, as again it was built to handle a higher level. And, finally, a 736 level would definitely be a safer lake for those boating.

Red Rock Lake has a tremendous economical impact on this community. I would like to see you enhance that potential, and feel that the 736 level would be a positive step in that direction.

Thank you for your consideration.

Yours truly,

FIRST FINANCIAL

Jim DeVore

Jim DeVore, Vice President
Bank Manager

JD:bdm

November 16, 1987

District Engineer
U.S. Army Engineer District. Rock Island
Attn: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

As a resident of Knoxville and as a concerned businessman, I am writing to express my views on the pending decision regarding the level of Lake Red Rock.

It is my understanding the Corps of Engineers has tentatively decided to recommend raising the level of Lake Red Rock to 734 feet NGVD, rather than the earlier proposal of 736 feet.

I am opposed to the 734 level for the following reasons:

- The lower level (734 feet NGVD) would create a likely boating hazard at old highway 14, meaning boaters could be lulled into thinking the depth is sufficient for them to navigate even the larger vessels.
- As one whose livelihood depends upon growth of our area populous, I feel the recreational aspects of the Lake will be less desirable at 734...and more attractive at 736. Further, the asthetic attraction of our region to an outsider would be greatly enhanced if the view from the mile-long bridge did not include mud flats. These flats will remain if the Lake is raised to only 734...while 736 would cover them.
- Operational problems of the Lake at 736 would be no more costly than at 734...and yet at 736 the Lake would encompass another 2500 acres...far more appealing to future development for our region economically and industrially.
- Money already spent on ramps, etc. was intended to facilitate a Lake level of up to 742 feet NGVD. Thes ramps, etc. would essentially be rendered useless at the lower levels tentatively recommended.

In conclusion, I am encouraging the Corps of engineers to consider the net economic impact on the area, and not acquiesce to a segment of our area populous that until now, has made the most noise regarding the issue. Ultimately, flood control and economic growth can be enjoyed by all if a higher elevation is implemented as soon as possible.

Sincerely,

Kirk M. Leonard

Kirk M. Leonard
1405 Woodland
Knoxville
Iowa 50138

Northern Fastener Engineering, Inc.
P.O. BOX 1911 DES MOINES, IOWA 50306 515-244-5708

November 16, 1987

Dudley Hanson P.E.
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Hanson:

After reading your letter of October 28th reporting that you have remanded control of Lake Red Rock to the farmers in the area, I began wondering exactly what the P.E. after your name stands for. How can you spend so much time and so much money studying what would happen if Lake Red Rock's level were raised to its designed level, also a level that it has maintained on its own several years, issue a report stating that it would be best to raise the lake to a level somewhat below that, and then finally announce that somebody was concerned so we changed our minds?

You could have saved a lot of time, money and aggravation by abdicating your responsibilities a couple years ago. I suppose that in a few years you will be spending even more for another study because (surprise!) Lake Red Rock is silting in again. I can guess the results. It seems logical to me that by raising the water level up to the prescribed fourteen foot level that the silting would occur upstream west of the highway 14 bridge and then it would take much longer to reach the main body of water than by the present method of a little at a time.

Also, I have never understood why the Corps did not originally purchase all of the farm land that would possibly be affected by the conservation pool and then lease it back to those who were willing to take the chance of being flooded out during the growing season. Some agreement to compensate the farmers actually flooded out each year could be made to cover their seed costs and lease payments if and when the crops were destroyed. Remember, they

must assume some risk, too i.e. profits or no-profits, for farming marginal lands. After all, nature has its' own way of making farming a risk on any given ground during any given year so why should we, the lake users, be denied the use of the lake by a few people who should expect to have water problems by the very location (elevation) of the ground.

I oppose keeping Lake Red Rock below its designed permanent conservation pool level any longer than the necessary time it takes to make adjustments to facilities around the lake.

Sincerely,

D. Wm Wahlers

D. Wm Wahlers
505 New York Avenue
Des Moines, Iowa 50313

November 16, 1987

Department of the Army
Rock Island District
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Gentlemen:

A recent article in the Des Moines paper indicated the current lake level at Red Rock Lake is about to change to 734 feet in May of 1988.

I believe the lake level needs to be raised but believe the figure of 736 feet that was considered should be used in May of 1988.

I would also be in favor of various lake levels for the water fowl season. This level needs to analyzed each year depending on prior lake levels and habitat. Once the level is picked it should go into effect two weeks prior to the opening of the hunting season. Cooperation between the Iowa Department of Natural Resources and the Army Corps of Engineers would be a good idea. This varying level idea should be in effect on all Corps of Engineers projects.

Bruce Garwood
4206 SE 3rd
Des Moines, Ia 50315

November 17, 1987

District Engineer,

U. S. Army Engineer District, Rock Island

Attn: Planning·Division, -P. O. Box 2004

Rock Island, Illinois 61204-2004

Dudley M. Hanson P.E.

Chief, Planning Division

Dear Sir:

The final water control plan(W.C. P) and supplemental environmental impact for the operation, maintenance at Lake Red Rock, Iowa we think is a very wise decisian. One which I suggested at our Pella July7th meeting. Step by step with a 734, future,742 future pool projected to occur in year 1999.

We have been conservationists for 40 years, so have met several problems with our farming. The best and newest program to help at control of the mud flat at Red Rock is now being incorporated in our conservation set aside 10 year plan to stop this wash out areas that shouldn' t be farmed.

In our opinion (for what it is worth) Sailorville Lake should have been built first, then graduated down from there to the Mississippi. The Red Lake area when the dam was finished really never had a chance because it was never cleaned out, because of flood water beforehand. That has been the base of this problem. In our opinion your plan step by step is more the best way, to solve the problem.

A Concerned Friend,

Ferold L. Grant,

Dorothy and Ferold L. Grant

Mr. and Mrs. Ferold L. Grant
Bar 'G' Ranch
2376 Fillmore St.
Swan, Iowa 50252

Continental Telephone Company
of Iowa
1214 West Jackson
Knoxville IA 50138
515 828 8400

CONTEL Telephone Operations

November 17, 1987

U.S. Corps of Engineers, Planning Division
Clock Town Building
P.O. Box 2004
Rock Island, Ill. 61204-20004

Dear Sirs:

The recent decision to reduce the proposed level of Lake Red Rock from 736 feet to 734 feet is of a great concern to Contel of Iowa. It is our opinion that this decision would have a negative impact on the economic as well as the aesthetic potential for the entire lake area.

We see no disadvantage in raising the Lake level to the proposed 736 feet as all of the boat ramps and facilities around the Lake were constructed to facilitate levels up to 742 feet. The continuing operating costs for the Lake would be basically the same at the 736 foot level. At the 734 level the size of the Lake is reduced by approximately 2500 acres as compared to the 736 foot elevation. This would have a negative impact on the aesthetic appearance of the Lake. At the 734 level the usable area for boating would be considerably reduced and would create hazardous boating conditions in the area along Highway 14 adjacent to the the Mile Long Bridge. The mud flat area directly east of the Mile Long Bridge would still be partially visible a majority of the time.

As most of the traffic crossing Lake Red Rock uses the Mile Long Bridge, this area would still present a negative first impression to the majority of persons seeing Lake Red Rock for the first time. As first impressions are usually lasting impressions, this would have a severe negative impact towards the economic development of Lake Red Rock Area. Raising of the Lake level to 736 feet would help to increase the land values in the Lake area. Many of the developments have remained dormant due to the appearance of the Lake. One of the Governor's objectives for Iowa is to increase tourism: Raising the level of the Lake would be in line with the Governor's plans. As the majority of the negative comments that we hear are concerning the aesthetic appearance of the Lake in the area adjacent to the Mile Long Bridge, we feel this is the most important decision that can be made in raising the level.

CONTEL

It is our feeling that the Corps needs to consider the net economic impact on the entire lake area and make their decision to enhance the economic potential of the area without effecting flood control. A higher level would accomplish this.

We therefore ask that your decision be to raise the level of Lake Red Rock to a 736 foot level immediately, and to pursue the original plan to raise the level to 742 feet.

Sincerely,

J. R. Horton
President

JRH:CH

xc: Congressman Jim Lightfoot
State Senator Bill Dieleman
State Representative Dave Schrader

Eye Care
&
Eye Wear

George H.Andrew, O.D., P.C.
Steven M. Gould, O.D.

Family Vision Clinic
217 East Main Street • Knoxville, Iowa 50138
515-842-2020

November 17,1987

Dear Sir,

I have heard that the latest discussion on raising the level of Red Rock Lake, centers around whether to go to 736 feet or 734 feet.

My very first impression of Knoxville and Lake Red Rock was at a time when the lake was up due to flood control, and I was very impressed. As the water level resided, I appreciated the conservation attitude of habitat and "flood pool" but the esthetic effect of a big lake over a mud flat, was very apparent.

I feel that the extra two feet of water would have a tremendously positive effect for attracting new business and people to the Knoxville-Pella area. I would like to cast a strong vote for 736 feet.

Best Regards,

Steven Gould

MEDICAP
PHARMACY™
909 W. PLEASANT • KNOXVILLE, IOWA 50138 • 515/828-7312

District Engineer
U. S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building P. O. Box 2004
Rock Island, Il 61204-2004

11-18-87

Dear Sirs:

I would like you to reconsider changing the new water level of Lake Red Rock from 736 to 734. The 736 level seems to have many more advantages. The following list states most of the more significant advantages:

(1) reduces the boating hazzard at the old highway 14 crossing.

(2) increases the size of the lake by 2,500 acres.

(3) eliminates the mud flats further away from the dam and past the mile long highway 14 bridge.

(4) improves the view of the lake from the highway 14 bridge where 80% of the people get their first impression of the lake.

The 2 foot increase in level should not cause any major problems with lake or dam operation, ramp capabilities, or lower flood control potential to any great extent. No change can eliminate all disadvantages but the advantages of 736 over 734 seems to be in the best interest to most of the people in the surrounding area.

Sincerly,

David A. Samuelson

David A. Samuelson

216 East Twelfth Street North
Newton, Iowa 50208
November 19, 1987

Department of Army
Rock Island District Corps of Engineers
P.O. Box 2004
Rock Island, Illinois 61204-2004

Re: Change in Permanent Pool Water Level
Lake Red Rock, Iowa

Gentlemen:

This writer is the owner of real estate on which an easement is imposed for flooding during periods of high water.

At the time the easement was acquired, he was told that this land would be flooded possibly once in every nineteen years. It has been flooded five times in the last sixteen years, with total destruction of the crop located on the easement property.

Your letter of October 28, 1987 states on page three as follows: "Impacts to other resources would be minimal". That is not true.

If the permanent pool level is raised, the water will stand on easement land during flood periods for a longer time with substantially more damage to crops and other vegetation.

Your attention is invited to the photocopy of a letter dated March 13, 1985 from the Civil Defense Coordinator and Marion County Zoning Administrator and also to a letter of the same date from the Marion County Board of Supervisors. These letters address the same problem that this writer is concerned with.

There is not only the flooding itself, but the flooding causes the water from the creek running through my property to back up and overflow, and both that overflow and the flooding makes deposits of sedimentation in the creek and on my land, which exacerbates the crop loss and increases the likelihood of future damage. We have spent more than the price paid for our easement in cleaning the sedimentation which resulted from the flooding out of the creek.

If the change in the lake level permanent pool is placed into effect, a new settlement needs to be made with persons whose ground is subjected to this easement.

Very truly yours,

Marion J. McCumber

Marion McCumber

MM/vm

cc: Senator Charles Grassley
Senator Tom Harkin
Representative Jim Ross Lightfoot
Representative Neal Smith

March 13, 1985

United States Engineer District
Rock Island
Clock Tower Bldg.
P.O. Box 2004
Rock Island, ILL
61204-2004

Re: Raising of permanent pool; Red Rock Dam

To Whom It May Concern:

It is the opinion of the Marion County Civil Defense office, that steps should be taken by the Corps of Engineers to correct the wrong-doing of the repeated flooding of easement ground without making proper adjustments to the property owners.

The raising of the permanent pool will only increase the flood potential and leave these people with ground absolutely useless for farming and abused far beyond what original estimates stated, making the idea of easements something that hardly falls into the ideals of our government.

I am sure the Corps of Engineers will take these matters into consideration before raising any levels of the dam above their own property at any time.

Sincerely,

John Mc Coy
Marion County Civil Defense Co-ordinator
Marion County Zoning Administrator

JM/bs

cc: Senator Charles Grassley
Senator Tom Harkin
Rep. Jim Ross Lightfoot
Rep. Neal Smith

MARION COUNTY BOARD OF SUPERVISORS
COURT HOUSE
KNOXVILLE, IOWA 50138
828-2231

March 13, 1985

TO WHOM IT MAY CONCERN:

It has been brought to the attention of the Marion County Board of Supervisors that the U.S. Army Corps of Engineers will be holding a meeting on March 27, 1985 at 1:00 p.m. at the National Guard Armory in Knoxville. The purpose of this hearing is to discuss the impact of the raising of the permanent pool in the Red Rock Dam.

It is the feeling of the Marion County Board of Supervisors that if this is the case and the minimum level of the pool must be raised, that action be taken to correct the problems created for land owners of which the government has only easements with. That these property owners are justly dealt with so as not to be flooded out again without just compensation, or the complete buying out of their property which is under easement.

The Marion County Board of Supervisors feel that it is only after such steps have been taken that any reasonable raising of the permanent pool could be warranted.

Sincerely,

Harold De Zwartz

Harold De Zwartz, Chairman
Marion County Board of Supervisors

Dick Dunkin

Dick Dunkin, Member

F Peak

Frank Peak, Member

MCBS/dc

Enclosure
cc: Senator Charles Grassley
Senator Tom Harkin
Rep. Jim Ross Lightfoot
Rep. Neal Smith

Medical Center Knoxville, IA 50138

Veterans Administration

November 20, 1987

In Reply Refer To: 592/001

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

SUBJ: Proposed Level of Red Rock Lake

1. The Veterans Administration Medical Center wishes to share its concern and comment on the proposed lake water level, urging consideration for the increase to 736 feet NGVD.

2. As a Knoxville health care facility, we employ over nine hundred individuals. When family members are factored in, the number goes to several thousand. These employees and family members view Red Rock Lake as a primary recreation area. This is lessened by the present water level and will not be greatly enhanced if the level is only raised to 734 feet NGVD. The mud flats inhibit increased use of the lake.

3. In our recruitment efforts, we advertise to a national market. The lake's present condition, and the 734 proposal, inhibits that process and its success. We highlight Red Rock Lake and its recreational activities in our advertising literature. When potential employees visit and view the lake's present condition, it ceases to be a positive reinforcement to locate themselves and their families. To address what might be in the future does not appear to be a selling point. Other health care facilities continue to publicize and promote recreational areas as a recruiting tool, placing us at a distinct disadvantage.

4. The absence of the fuller, possible range of recreational areas also serves as a negative factor in the retention of our current employees. Employee retention is an element of productivity that concerns us greatly in a time of shrinking resources. This becomes very costly to us as an agency.

5. We are aware of the present lease arrangements your agency has with many individuals. We urge the nonrenewal of those leases upon their expiration. This would provide you with more options, absent of restrictions.

6. We urge you to give due consideration to the impact your decisions have on this facility, its employees and their families, our recruitment and retention efforts which enrich and enhance this community's

District Engineer

life and future, and those others in the Knoxville area who wish Red Rock Lake to fully develop its recreational potential.

7. We recognize there are certain agricultural interests relating to the water level issue, and we are sensitive to those concerns. We are not knowledgeable to address those issues. Perhaps some of the land adversely impacted could be purchased by the Government to ease that situation if that is the problem. We can only speak to the aspects of this that most affect our facility. It appears to us that raising the level to 736 and higher levels would enhance the future of this geographic area and be a positive selling point for growth and development.

Don Ziska

DON ZISKA
Medical Center Director

11-20-87

Dear Sir:

In response to the Corps compromising on the raising of Lake Red Rock, I have the following comments:

(1) Even though the raise, to 734 feet, would cover the mud flats this would be a dangerous situation. Water cover would be less than 3 feet, over these flats! This would, no doubt, be the cause of many boaters hitting mud and becoming stuck.

(2) Please re-consider your original intent to raise to 736 feet in 1988 and a raise to 742 feet by 1990.

The covering of the mud flats would, indeed, improve the looks of the lake. And, that is very important.

However, it will not open the lake to much increase in recreation. You can imagine the impact of a boat or water skiers, going 20-30 mph and hitting bottom in this area. The water cover, unless marked for depth will give a false sense of security.

Thank you for your consideration.

Henry Randolph

CHICAGO AND NORTH WESTERN TRANSPORTATION COMPANY

D. L. BOGER
VICE PRESIDENT—ENGINEERING

November 19, 1987

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

This is in regard to the Project Report Update of October 28, 1987 for the Draft Water Control Plan - Lake Red Rock, Iowa.

In reviewing this document, I am concerned about the lack of attention accorded potential problems with C&NW railroad embankment as presented in Mr. H. T. Paton's letter of September 29, 1987, to you & my letter of August 28, 1987 to Mr. Paton. Railroad relocation may not be necessary if reasonable measures are taken to protect the embankment from further deterioration, however, it does not appear this matter has ever been addressed.

If your schedule for raising the conservation pool in May of 1988 remains valid, there is little time left to study, plan & implement protection for C&NW embankment.

We would be pleased to meet with you and discuss our concerns in greater detail if that would help in clarifying our position.

Until such time as our concerns are addressed, please accept this letter as notice that we are vehemently opposed to your proposal.

It would be appreciated if you would review this matter and respond in a timely manner.

Sincerely,

cc: H. T. Paton
J. A. Leeper
G. E. Drake

ONE NORTH WESTERN CENTER / CHICAGO, ILLINOIS 60606 / 312-559-6290

M. Joan Farver
2609 Spring Grove Terrace
Colorado Springs, Colorado 80906

November 21, 1987

To: District Engineer -

I keep a boat - in the summer - on Red Rock Lake at the Lake Red Rock Marina; and certainly hope your office will keep the lake at a level to permit safe boating and recreation. The excavation of historical artifacts should be accomplished as well as erosion prevented - or at least controlled - if at all possible.

Good engineering practices should be the order of the day.

Sincerely Joan Farver

THE LAW SCHOOL
Drake University

November 23, 1987

District Engineer
Rock Island Engineer District
Planning Division
Clock Tower Bldg.
P.O. Box 2004
Rock Island, Illinois 61204-2004

Re: Comment on Lake Redrock Level Change Proposal

Dear District Engineer:

I own a boat using Lake Redrock.

The current pool level of 728 feet above sea level is so inadequate as to be unsafe--light draft boats go aground in apparently open water. It is also unsightly. Congress did not intend to create Lake Mudflat.

The proposed 734' level will leave inadequate water to open the miles proximate to the Iowa Highway 14 bridge for reasonable navigation or use--the hoped for 3-foot depth is not adequate for many sailboats and not uniformly available in any event.

Because of the level, this lake is a muddy mess, aesthetically revolting and unreasonable for recreational use as well as a health problem.

I recommend getting the level up to the levels previously discussed--736' next year and 742' by 1999.

Sincerely yours,

Arthur E. Ryman, Jr.
Professor of Law
Drake University Law School
Des Moines, Iowa 50311

AER/kw

cc: Lake Red Rock Marina
RR 1
Pella, Iowa 50219

Representative Neal Smith
House Office Building
Washington, D.C.

Des Moines Iowa 50311 • Phone 515-271-2824

Have heard the Corp of Engineers is planning to reduce the proposed lake level from 736 to 734.

This would produce a negative for the economic and aesthetic ~~potential~~ of the lake. Elevation 734 reduces the size of the lake by 2,500 acres. The effect on either side of the mile long bridge would be more negative — this view is the first impression many get for the first time.

Please think about the boating hazard old highway 14 would create with the level at 734 ft.

Sincerely Yours.

Edwin J. Ford
Oxley, Ia.

LAKE RED ROCK MARINA LTD.
Fifield Road Route 1
Pella, Iowa 50219
(515) 627-5743

November 24, 1987

Col. Neil Smart, Commander
Rock Island District Corps of Engineers
Department of the Army
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Smart,

As you might guess, as manager of Lake Red Rock Marina, I have given lots of thought to how we cna put in new dock space and make better use of what we have when the lake goes up. The announcement a month ago of your compromise proposal of a six foot raise was a good surprise in showing that you are anxious to get on with it. It's a morale booster to our customers and the people who have written so many letters and gone to so many meetings in hopes of seeing their favorite lake become bigger and better.

However, a 6 foot rise does not do it. Even the eight-foot (736) raise would not signifigantly impact the lake and marina basin.

In anticipation of 736, I was preparing a proposal for some excavating which would greatly enhance our storage capacity for boats. With only 6 more feet of water it would not be feasible. With the lake at 742, the water would be deep enough so as not to need to do it. If the excavation were done in preparation for 736, it would be of benefit then and at 742!

A lake level rise of 6 feet would create an illusion of safe boating for several square miles over the mud flats near Hwy 14 bridge(....and around the rim of Wallaschuck Creek basin where the marina is.) While creating the appearance of a beautiful, big lake, the vast mud-flat area would be submerged only 2-4 feet. The river has deposited and embedded in this area many obstacles which would be lurking just below the surface. The only boats which could safely navigate the deceptive water near th bridge would be small fishing and duck boats. Water-sking and other speed boat activity in that area which would look so inviting from the bridge would be positively unsafe. It would only fuel the opinion of Red Rock as an unsafe lake.

A lake level of 736 would put a sufficient amount of water for safe boating over the mud flats except for sailboats with a four foot draft and still unsafe, I feel, for skiers. We would encourage the removal of the obstacles mentioned during the winter before the lake is raised. A lake level raise to 742 would cover the problem entirely. The only resulting hazard would be where people would expect them.

I also would urge the Corps to urgently pursue methods of reducing siltation of Iowa's topsoi[illegible]

I regret that I cannot e[illegible]siastically support your effort to resolve the problem of Red Rc[illegible]s lake level. While I truly appreciate your effort for a rise a[illegible] early as May of '88, I feel that I must share my concerns with you about only a six foot rise.

Sincerely, Kurt Hoover

I-161

Manager—Lake Red Rock Marina

STATE OF
IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

November 25, 1987

Col. Neal A. Smart
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building
P. O. Box 2004
Rock Island, IL 61204-2004

Dear Col. Smart:

I would like to thank you for the project report update for the draft water control plan with draft supplemental environmental impact statement for Lake Red Rock, Iowa. I am most disappointed in your tentative decision to raise the conversation pool to 734 feet NGVD as soon as practicable with a future pool raised to elevation 742 feet NGVD in accordance with an agreement yet to be established between the federal government and the state of Iowa. On July 7, 1987, Governor Terry Branstad submitted a letter to you stating the support of the state of Iowa for an immediate raise of the conse. .tion pool at Red Rock Reservoir to 736 with a raise to 742 within two years. Also, at your public hearing on July 7, 1987 in Pella concerning Red Rock Reservoir conservation pool levels, I delivered a public statement in which the Department of Natural Resources recommended:

1. That the conservation pool be immediately raised to 736 feet NGVD and that the pool be further raised within two years to 742 feet NGVD. That all costs for evaluating, redesigning and reconstructing facilities be incurred by the federal government.

2. That the raising of the conservation pool to 742 feet NGVD would inundate approximately an additional 10,000 acres of land. The easement lands at Red Rock Reservoir should be acquired in fee title by the U.S. Army Corps of Engineers and included in the fish and wildlife license to the Department of Natural Resources.

3. That the Corps of Engineers institute a flexible fall pool raise in future management plans. This flexible fall pool raise would be between 0 and 6 feet per year and could be in two or more stages within a year. Coordination would be between the Director of the Iowa Department of Natural Resources and the District Engineer of the U.S. Corps of Engineers in late August of each year. This flexible and staged fall pool raise would allow response to a particular year's water level and vegetation conditions in providing fall habitat for migratory waterfowl.

4. I also affirmed the state's position that the Corps of Engineers must maintain a minimum of 50,000-acre feet of conservation storage in Red Rock Reservoir for the purposes of low-flow augmentation.

5. I recommend improved regulation on the release rates which entail lengthening the period during which outflow will not exceed 30,000 cfs by ten days and increasing the maximum outflow from 18,000 to 22,000 cfs when pool elevation is above 760 feet NGVD during the growing season.

No justification or benefits of your "734" decision are stated in the report update. The Iowa Department of Natural Resources has not changed their position on changes in the conservation pool at Red Rock Reservoir. I urge you to reconsider your tentative conclusion and follow our recommended course of action.

The flexible fall pool raise and the schedule for the ultimate raise to 742 are significant issues. I request that you implement a program of flexible and staged fall pool raises of from 0 to 6 feet to provide beneficial habitat for migrating waterfowl. Again, this should be coordinated with the Director of the Department of Natural Resources in late August of each year. Also, I would further request that if you follow the alternative of raising the conservation pool to 734 feet NGVD, that you make immediate plans to raise it to 742 feet NGVD within a two-year period.

Sincerely,

LARRY J. WILSON
DIRECTOR

lb/L17.LSB

Nov 25, 1987

Dear Sirs,

I am writing in concern of the lake level being reduced from 736 to 734

(1) 734 is going to present a problem for boaters at Old Highway 14. How many injuries to a life is 2 feet worth?

(2) I own land west of Highway 14 and the extra 2 feet would cover most of the mud flats that I would have to look at

(3) The higher lake level would bring in more boaters, fishermen, tourists & would also benefit the county economically.

Would you please consider the above before you lower the lake level to 734

Thank you

L. Michael Crosby

HAMMER'S INC.
HIGHWAY 20 AND 65 NORTH IOWA FALLS, IOWA 50126
(515) 648-5183
TELEX NUMBER 883413 ANSWER BACK HAMMERS UNUD

November 25, 1987

Pat Burke
District Engineer
U.S. Army Engineer District Rock Island
Attn: Planning Division
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

Dear Mr. Burke:

I read a recent article in the Herald by Staff Writer Deb Belt concerning the re-revised lake levels for Lake Red Rock. The purpose of my letter is to strongly oppose your proposed new recommendation of raising the Lake Red Rock level to 734 feet in May. I am well aware that life in politics is a series of compromises and 734 feet was a compromise. I feel that I understand some of the problems that are facing you from land owners, and I'm equally sure that if you do take a compromising position at this time of dropping from your stated 736 to 742 back to 734 with no date for the 742 rise, you will face a difficult challenge when the mud flats once again reappear.

I would strongly recommend that you stick by the original recommendations with which most people would generally agree. I think this would be a prudent action for today as well as for tomorrow.

Best personal regards,

Floyd Hammer

Floyd Hammer
President
Hammer's Inc.

FH/vjn

1403 W 13th St. S.
Newton, Iowa
November 27, 1987

Chief Engineer
Planning Division
Rock Island District Corps of Engineers
Clock Tower Building
Rock Island, Illinois

Planning Division -

As owner of Lake Red Rock Marina - a Corps concession on the Lake, I say hurrah to the show of faith evidenced in a compromise offer to raise the lake level by six feet in May, 1988. Our customers, the long term ones and the just-coming-by ones, were ready to throw in the towel as far as expecting anything would come of all the meetings, letters, etc. It got increasingly difficult to discuss the matter. So I welcomed the compromise proposal.

However, being realistic, I can't continue to shout hurrah! As we think it over, plan adjustments and listen to the boaters, we are going to have suggest that a six-foot raise would create un-safe boating on the lake. The mud-flats below the bridge, covered with less than six feet of water as their banks vary, would look like a marvelous, vast new

ski and cruising area. Especially for skiing, the deceptive surface would be hazardous. At eight feet, it would be more safe.

Six more feet of water at Lake Red Rock will not do it. At the marina, its a yes - no situation. Mostly the problems created would be the shallows that would be created.

We wish you good luck in your sincere efforts to resolve the complex problem of the lake level at Red Rock.

Sincerely,
Ruth S. Hoover

736 is far more workable than 734. 742, as soon as possible, is what I would really like to see.

GALVIN REALTY

218 SOUTH SECOND STREET OFFICE PHONE 842-2910

KNOXVILLE, IOWA 50138

November 27, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

ATTENTION: Planning Division

RE: RED ROCK LAKE LEVEL

I, again, want to go on record as urging the Corps to raise the lake level to at least 736.

I feel that only going to 734 would not accomplish what you are trying to do, as the sediment would soon bring the situation to be about the same as it is now.

To me, you have gone through the procedure and received both opposition and favorable support to raise the lake level, and if you just raise it to 734, you will have to go through this same public acceptance when you are required to go to 736 at a later date.

There is certainly cost advantage to take the higher program at this time, and even for the future.

I do own some property that is subject to flowage easement, but this does not affect me one way or the other, only for the good of the whole project to raise it to 736. I think you will find my comments in your file, where I have expressed favoring going to 742 as soon as possible.

C. R. Galvin

C. R. Galvin

CRG:mbvs

REALTOR®

MASTER SENIOR APPRAISER™

November 29, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sir or Madam:

In reference to the proposed Red Rock Lake level reduction from 736 feet NGVD to 734 feet NGVD, I feel it would have a negative impact on the economic and aesthetic potential of the lake.

Currently when you drive by the lake on Highway 14 one can't help but notice the unsightly mud flats. With the level raised to 734 the mud flats would still be visible from the highway. Most people get their first impression of the lake from this vantage point. A beautiful lake view would have a positive effect on the people driving by and hence a more positive attitude towards the entire lake area.

Please consider the net economic impact on the area and make your decision to enhance the potential of the lake. I believe a higher level would accomplish this goal. Thank you.

Sincerely,

Tim Leach

Tim Leach

United States
Department of
Agriculture

Soil
Conservation
Service

693 Federal Building
210 Walnut Street
Des Moines, Iowa 50309

November 30, 1987

Colonel Neil A. Smart
District Engineer
U.S. Army Corps of Engineers
Rock Island District
ATTN: Planning Division
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

We have recently reviewed the "Project Report Update for Draft Water Control Plan with Draft Supplemental Environmental Impact Statement, Lake Red Rock, Iowa," dated October 28, 1987.

We are concerned about the contents of the report because there is no reference to remedying the source of the sedimentation problem. We understand it is necessary to raise Lake Red Rock because it is being filled by sediment. The major item of public comment identified is the flooding impact upon easement lands and downstream flooding and erosion. Also, a considerable amount of concern has been expressed regarding sedimentation in the Lake Red Rock pool. A more thorough discussion of the sedimentation problem would be in order. More discussion on the cause for the pool raise (ie excessive rates of sedimentation) would result in a better informed public.

Benefits due to increased boating and recreation will be realized. However, without taking positive action to curb sedimentation rates these particular benefits will be short lived. Sedimentation also has a negative effect on fish and wildlife resources. It affects wetland areas in the upper reaches of the pool. Since Lake Red Rock has become a major migration pathway for water fowl in Iowa, this is a significant impact. The fishery will also be severely impacted by continued rapid delivery of sediment into the pool area. Raising the pool level without improving water quality will have a minimal benefit on the existing fishery. If sedimentation rates are significantly decreased, the fishery will be tremendously benefitted because reduced turbidity will allow faster growth rates for sight feeding fish and an opportunity for stocking of game fish species.

As we emphasized in our letter of August 31, 1987, we feel strongly that a plan for raising the lake should also include a plan for control of sedimentation into Lake Red Rock. Raising the pool without such a plan is short sighted and will result in major problems for future generations. Not only will these problems be economically costly, but a major resource in Iowa will be lost. We believe it is essential that a plan of action be developed to curb the sedimentation problem and that raising of the lake be carried out concurrently with actions to solve the sedimentation problem. Such actions will best serve the citizens of Iowa.

Thank you for the opportunity to review and comment on this report.

Sincerely,

Douglas C. Sait, Acting

J. Michael Nethery
State Conservationist

106 East Montgomery
Knoxville, Iowa 50138
December 1, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Attention: Planning Division

Dear Sir;

I am very disappointed to learn that you propose to raise Lake Red Rock to 734 instead of 736 as was first proposed. I understand that there is no advantage to operating the lake at the 734 level and it makes no difference in its operation. This level will be a hazzard to boaters and will only add to to the lake's silting in the area of Highway 14.

I am disappointed that you propose to not raise Lake Red Rock to 742 until 1999--there should be plenty of silt in the lakebed by then--it should be done next year at the latest.

The lake could be a great asset to our community. Recreation is a good, clean industry. With the over abundance of crops on the market, it seems we should be able to use recreation as an alternative source of income, as this affects a great many people.

Yours truly,

Ken Freeman

Kenneth G. Freeman

Modern Jewelers
105 South 3rd Street
Knoxville, Iowa 50138

District Engineer
U.S. Army Engineer District, Rock Island
Attention Planning Division
Clock Tower building- P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

I am writing to express my concern for the Corp of Engineers proposed reduction of Lake Red Rock from 736 to 734.

I feel that an elev. of 734 would create a definite boating hazzard at Old Highway 14. That is the last thing we need to prevent tourist from coming to our area.

The larger the lake, the more recreational activities will be available for the local people as well as the tourist.

It appears to be a big joke when people drive over the mile long bridge and view the mud flats that are suppose to be Lake Red Rock!!!!

What difference in operation would there be if the lake is 736 instead of 734??? I can't see an advantage.

A higher elevation would enhance the economic potential without affecting the flood control.

I would appreciate any consideration you would give to not reducing Lake Red Rock.

Sincerely,

Frank L. Dugger

Frank L. Dugger
Owner Modern Jewelers

IOWA REALTY
an IOWA REALTY member company

1602 N. Lincoln
Knoxville, Iowa 50138
(515) 842-5116

District Engineer
U.S. Army Engineer District, Rock Island
Att. Planning Division
Clock Tower Building-P.O. Box 2004
Rock Island, Illinois 61204-2004

This letter is in concern over the Corp of Engineers proposed level of Red Rock Lake. We are concerned that the Corp is considering raising the lake to only 734 instead of 736.

First I would like to give you some of my background. My grandfather first purchased farm ground in the area in 1882. The first piece of ground he bought was 160 acres, this property was never to be sold outside of the family. However, the lake has changed that. A great deal of family farms were lost under the same situation. These were farms which people had worked for years to keepup and take pride in.

Over the past several years what we have now is an unsightly mess. The project from Highway 14 is not attractive at all. This reflects directly on Marion County and the people of the County. This area at one time before the lake was developed was rich farm ground and nice homesteads, and now we don't even have an attractive lake. At least by raising the level of Red Rock, it would cover a lot of the mud and silt which looks so bad. New people coming to the area and see the lake never think that Rock Island controls it, it is a direct reflection on the people of Marion County.

If the lake were raised, considrerable less danger would affect boaters also. The lake in its present condition is very dangerous. Old Highway 14 at times is only a few feet under the water level or just above. Also many of the old bridges are either not covered or just covered and this is a danger factor to boaters.

Hopefully by the Corp raising the level it would also help development areas around the lake. By increasing the price for homes in the area and the possibility of new construction taking place. Being in the Real Estate Buisness I have herd several people say if the lake were attactive it would be a nice area to build. This would help the tax situation here also, by creating more taxable reaestate.

IOWA REALTY
an IOWA REALTY member company

**1602 N. Lincoln
Knoxville, Iowa 50138
(515) 842-5116**

I certainly hope the Corp will consider raising the level of the lake and be able to see the benifits it would pass on to Marion County. Being born and raised in the area, and the family losing a farm to the lake I hope they will at least consider how the people feel who live here and work here.

Thank you for your time and consideration of this mater. I hope you will give it your full attention.

Rich DeHeer
Knoxville-Iowa Realty

District Engineer
U.S. Army Engineer District
Rock Island
att: Planning Division

Dear Sir!

You say that raising the permanent pool from 728'–734' would not make any different in the frequencies of flooding the easement ground. Any one with any common sence would know that does not make sence.

You have already flooded the easement ground more often than you orginal planned. If you hold the level to 734 (11,000 A) it ~~[illegible]~~ would have to flood it more often than before.

The easement ground must be bought out right before any changes should take place. It will also cost the tax payers a lot more money to maintain the parks roads boat ramps and all other things involved.

Thank you
Benj. J. Kane
R# 5 Knoxville
Iowa 50138

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ROCK ISLAND FIELD OFFICE (ES)
1830 Second Avenue, Second Floor
Rock Island, Illinois 61201

IN REPLY REFER TO:
COM: 309/793-5800
FTS: 386-5800

March 21, 1988

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

This constitutes our final Fish and Wildlife Coordination Act Report which evaluates the alternatives to the regulation of Lake Red Rock on the Des Moines River, Marion County, Iowa. It has been prepared in accordance with Section 2 of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); the Endangered Species Act of 1973, as amended; and the National Environmental Policy Act of 1969. This report fulfills the requirements of Letter Order NCR-IA-86-0083 dated April 8, 1986, as revised per my letter of July 18, 1986. The report has been coordinated with the Iowa Department of Natural Resources.

Our agency prepared reports on the fish and wildlife aspects of the Red Rock Reservoir project in 1945 and 1948. In 1953 a comprehensive report was prepared concerning the water development plan for the Des Moines River including both the Red Rock and Saylorville Reservoir projects. A report was also prepared in 1960 to evaluate the impacts on fish and wildlife of three different conservation pool alternatives for Lake Red Rock, which was then in the preliminary stages of construction.

DESCRIPTION OF THE PROJECT

Lake Red Rock reservoir is formed by a dam on the Des Moines River, 142.9 miles above its confluence with the Mississippi River. The project was authorized for flood control by the Flood Control Act of 1938. Recreation, fish and wildlife and hydropower facilities were subsequently authorized by the Flood Control Act of 1944. Section 111 of the Water Resources Development Act of 1976 authorizes the Corps of Engineers (Corps) to:

> ...(1) undertake such measures, including renegotiating existing easements and the acquisition of additional interests in land, as appropriate to operate Saylorville Lake and Lake Red Rock projects, singly or as a system, to obtain the maximum benefits therefrom in the public interest...and (2) provide for the full development of campground and other recreation sites and access thereto for the Lake Red Rock and Saylorville Lake projects at Federal cost...

Land acquisition for Lake Red Rock was accomplished subsequent to implementation of the 1962 Joint Policy of the Departments of the Interior and of the Army Relative to Reservoir Project Lands (43 C.F.R. Part 8). The intent of the joint policy is to reduce the amount of flowage easements acquired at Federal reservoirs so that public access to each project's recreational and fish and wildlife resources could be improved. However, over 29,000 acres of flowage easements were acquired below Red Rock reservoir's maximum flowage line. Public Law 99-190 authorizes the Corps to acquire fee simple title from willing sellers in most of the easement area.

Approximately 47,600 acres of land were acquired in fee simple for the project, which was completed in 1969. Originally the conservation pool was maintained at elevation 725 [all elevations in National Geodetic Vertical Datum- NVGD], but by 1979 approximately 30% of the reservoir's sediment storage was filled, and the normal pool was raised to 728. The 728 elevation initially inundated approximately 8,900 acres of project lands. Sedimentation has currently reduced the surface area to about 6,875 acres. Between September 15 and December 15 the pool elevation is raised to 730 to improve waterfowl habitat at the project. Approximately 65,500 surface acres would be impounded at maximum flood pool elevation 780. Maintenance of the conservation pool elevation is dependent on reservoir releases which are regulated so that the maximum release in the crop season is 18,000 cubic feet per second (cfs). Maximum release in the non-crop season is 30,000 cfs.

SELECTED PLAN

Hydrological studies for the Lake Red Rock project completed prior to construction assumed an even distribution of entrapped sediments below the flood pool (elevation 780). In fact, surveys since the project became operational indicate that 75% of the sediment has accumulated below elevation 730. The Corps predicts that sedimentation will eventually make it necessary to raise the conservation pool to elevation 742, in order to provide storage for authorized purposes (such as low flow augmentation downstream of the project). The 742 elevation is the maximum stage that can be maintained without serious infringement on the reservoir's

flood storage capacity. The current study analyzed several scenarios for the conservation pool in the interim. The alternatives varied from elimination of the conservation pool ("dry reservoir") to immediately raising the normal pool to the maximum elevation of 742.

Our draft report recommended a single-step raise to elevation 742, or a conservation pool elevation of 736 for five or more years before raising to elevation 742. Our recommendations also emphasized the need for implementation of a flexible fall pool raise, regardless of the conservation pool elevation selected.

Based upon public and agency concerns expressed during review of the draft report, the Corps has tentatively selected a conservation pool raise to elevation 734 as soon as practicable. The future pool raise to elevation 742 would occur at an undetermined time in the future, subject to an agreement yet to be established between the Federal Government and the State of Iowa. A decision with regard to a flexible fall pool raise has been deferred until further hydrological studies have been completed.

FISH AND WILDLIFE RESOURCES

A General Plan for Wildlife Conservation, pursuant to Section 3 of the Fish and Wildlife Coordination Act, was consummated for Lake Red Rock in 1967. In conjunction with the plan the Secretary of the Interior determined that the project land and waters do have value to the National Migratory Bird Program, and that it would be in the public interest for the State to manage the area.

Terrestrial resources- The Iowa Department of Natural Resources (Department) has an active management program for wildlife at Lake Red Rock. Approximately 25,600 acres of project lands are licensed to the Department, of which about 2,100 acres are designated as waterfowl refuge, and about 9,000 acres are allocated to food plots. A corn-bean rotation is used on the bottomlands, and a corn-oat-hay rotation is used on the upland sites. About 10 to 15% of the crop is left in the field for wildlife food. Included in these lands is the Swan Refuge that contains five sub-impoundments totalling 1,000 acres for moist soil management. The sub-impoundments are seeded with Japanese millet, corn, and grain sorghum and pumped with water prior to the fall waterfowl migration. In addition, as water levels permit, the mudflats created by the reservoir are seeded with Japanese millet. A Canada goose call flock has been established at the North Headquarters that now numbers approximately 125 birds. Waterfowl management at the project has resulted in its becoming the most important stopover area in interior Iowa.

The Corps also has an active wildlife habitat development program on the project lands outside of the licensed area. The program consists of tree, hedge and shrub plantings, native prairie

establishment, prairie management, and installation of wood duck and bluebird nesting boxes. There is also an active forest management program for project lands.

Aquatic resources- Fishery management by the Department at Lake Red Rock consists mainly of stocking activities and regulation of commercial fishing. The stocking is done on an "as available" basis, and northern pike and walleye have been stocked annually since 1969. The program has had only moderate success in the reservoir because of the high migration rate of those species. The fishery upstream and downstream of the reservoir has definitely been improved.

Commercial fishing at the reservoir has resulted in significant harvest of bigmouth buffalo, carp and freshwater drum. The first market value for the 1985 harvest was over $32,000.

Sport fishing at Lake Red Rock is primarily for crappie sp., white bass, largemouth bass and channel catfish. The abundance and distribution of these species in the reservoir is dependent on pool level fluctuations. If the reservoir level stabilizes in the flood storage pool during the spring spawning season, the result is usually a strong year-class for all four species.

ENDANGERED SPECIES

The Federally endangered bald eagle and Indiana bat are known to utilize habitats on or adjacent to Lake Red Rock project lands. The Indiana bat has been documented immediately east of the Wallashuck Recreation Area. However, we concur with your determination that the various alternative water control plans under study should have no significant effect on Federally listed endangered species or their habitats. This precludes the need for further action on this study as required under Section 7 of the Endangered Species Act of 1973, as amended. Should the selected plan be modified or new information indicate endangered species may be affected, consultation should be initiated.

DISCUSSION

Terrestrial resources- As stated in our letter of July 18, 1986, there appears to be little difference between the water control alternatives with regard to impacts to fish and wildlife resources at the project. The study area is nearly all below the maximum flowage line of the reservoir, and is subject to varying degrees of inundation, depending upon precipitation run-off in the basin. Extended high water periods for five of the last eight years have resulted in reduced terrestrial habitat values in the zone between elevations 728 and 742. The predominant vegetation established in this zone consists of invader species such as smartweed, willow, pigweed and buttonweed. Some of these plant species provide food for waterfowl, but the area is of

marginal food and cover value for many typical bottomland wildlife species, such as deer, furbearers and many songbirds. Raising the normal pool elevation will further reduce the habitat for those species at this project.

Management practices on the State wildlife area will need to be adjusted when the normal pool is raised. Areas for productive food plots will be reduced, and the existing moist soil management units will become less effective as the normal pool elevation approaches elevation 742. The fact that the 1962 land acquisition policy was not adhered to in the upper portions of this project will result in a net loss of terrestrial habitat quality. The reduced manageable area of fee title lands will not be of sufficient size to provide the same quality of public access and wildlife populations currently enjoyed by project visitors.

The net loss of terrestrial habitat caused by raising the normal pool can be reduced if the current fall pool raise can be modified to 1) affect a larger zone of habitat (i.e. six to eight feet of elevation versus the current two feet), and 2) can be adjusted yearly to reflect existing habitat conditions in the management zone.

Aquatic resources- A significant conservation pool raise will probably provide initial benefits to the aquatic resources in Lake Red Rock reservoir. Recreationists at newly constructed reservoirs usually enjoy a three to five year period of good game fish harvests. Unfortunately, these conditions usually deteriorate rapidly for reasons that are not entirely understood. One factor that is involved in the deterioration is the loss of spawning substrates to sedimentation, which has surely been a problem at Lake Red Rock. Increasing the size of normal reservoir pools increases, and sometimes rejuvenates, established fish populations, because new spawning and feeding areas are created. However, the population gains for game fish may be offset by the associated increase of rough fish, particularly if the newly flooded substrate is unvegetated mudflats.

CONCLUSIONS AND RECOMMENDATIONS

Elevating the conservation pool level at Lake Red Rock will have short term, beneficial impacts to aquatic resources, but will reduce the size and quality of the State wildlife management area. Therefore, we recommend that:

1. the tentatively selected plan be modified to include a new conservation pool elevation of 736, rather than 734, in order to provide potential for greater fishery benefits;

2. the date for implementation of the new conservation pool elevation be selected in coordinated with the Iowa Department of Natural Resources, in order to provide the maximum potential benefit to fish and/or wildlife habitats;

3. the hydrological studies to determine the extent and feasibility of a variable fall pool raise for fish and wildlife management be initiated immediately;

4. boat ramps and public access facilities be relocated at Federal cost, as authorized by Section 111 of Public Law 94-587;

5. expeditious fee title acquisition from willing sellers of flowage easement tracts contiguous with Lake Red Rock project lands, as authorized by Public Law 99-190 and Section 111 of Public Law 94-587;

6. the easement tracts acquired in fee by the United States be made available to the Iowa Department of Natural Resources, by amendment to its existing wildlife license; and,

7. the Lake Red Rock General Plan be amended to reflect the revised project lands allocated to fish and wildlife purposes, when the acquisition program is completed.

If you have any questions or comments concerning this report and recommendations please do not hesitate to contact me.

Sincerely,

Richard C. Nelson
Field Supervisor

cc: Iowa DNR
RD - ARD AE
WO- ES Branch of Federal Activities

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW. #809
Washington, DC 20004

APR 1 2 1988

Mr. Dudley M. Hanson
Chief, Planning Division
Rock Island District
U.S. Army Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

REF: Pool Raise Project, Lake Red Rock
Marion, Jasper, Warren, and Polk Counties, Iowa

Dear Mr. Hanson:

We have received and reviewed information on the referenced project, including the archeological testing report perpared by American Resources Group, Inc., along with your determination that the project would not adversely affect seven archeological sites eligible for inclusion in the National Register of Historic Places. We have reviewed your supporting documentation, including the concurrence of the Iowa State Historic Preservation Officer, and we agree with your determination.

This letter evidences that the requirements of Section 106 of the National Historic Preservation Act and the Council's regulations have been met for this project. Both this letter and your supporting documentation should be retained in your environmental or project files.

Thank you for your continued cooperation.

Sincerely,

Don L. Klima
Chief, Eastern Division
of Project Review

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

CENCR-PD-E

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

FOR OPERATION AND MAINTENANCE

AT

LAKE RED ROCK, IOWA

MAY 1988

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR OPERATION AND MAINTENANCE AT LAKE RED ROCK, IOWA

The responsible lead agency for this project is the U.S. Army Engineer District, Rock Island, Illinois. Other involved agencies are the U.S. Fish and Wildlife Service and the Iowa Department of Natural Resources.

Abstract: Alternatives to the operation and regulation of Lake Red Rock, in Marion County, Iowa, have been considered. The current operation plan requires raising the lake at specified intervals to compensate for sedimentation and to maintain the 50,000 acre-feet of water originally approved for the reservoir. This is the No Action alternative. (Reference page 32 of the Water Control Plan.) Other alternatives would provide for raising the lake to predetermined levels at predetermined intervals.

Alternatives which have been considered involve revised release rates and include: maintain present operations; dry reservoir; one-step raise from 728 to 742 feet NGVD (National Geodetic Vertical Datum); two-step raise 728-736-742 feet NGVD; three-step raise 728-732-736-742 feet NGVD; and dredging of accumulated sediments.

Based upon additional review, the final recommendation (Plan 7) has been modified to be a one-step conservation pool raise to elevation 734 feet NGVD. Plan 7 does not include a date for a future raise or raises. The final plan includes a 2-foot fall pool raise for the benefit of migrating waterfowl and improvements in the regulation schedule.

The plan recognizes, however, that the storage at elevation 734.0 will be inadequate sometime in the future to provide storage for low-flow augmentation as sediments accumulate. Because of this, it will be necessary to again raise the level of the conservation pool in the future. Computations show that a conservation pool elevation of 742.0 feet provides adequate low-flow augmentation storage and sediment storage for 100 years of sediment accumulation. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation will be completed. Any plan resulting in a reduction in the degree of flood control provided by the project would require congressional authorization.

If you would like further information on this statement, please contact:

SEND YOUR COMMENTS TO THE DISTRICT ENGINEER

U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004
Telephone: (309) 788-6361 Ext. 386

NOTE: Information, displays, maps, etc. discussed in the Water Control Plan, Lake Red Rock, Iowa, are incorporated by reference in this Final Supplemental Environmental Impact Statement (SEIS).

SUMMARY

DESCRIPTION OF ACTION:

This report presents supplemental information to the Final Environmental Impact Statement for Operation and Maintenance of Red Rock Dam and Lake Red Rock, Des Moines River, Iowa. The Final EIS was filed with the Council on Environmental Quality on August 24, 1976. That document addressed the following activities: (a) maintaining controlled discharges to prevent downstream flooding; (b) periodic structure repair and landscaping; (c) maintaining seven recreation facilities located on the periphery of the lake; (d) mowing lawns in grass-covered areas during the spring, summer, and fall; (e) removing debris, e.g., fallen trees and limbs, periodically from recreation areas; (f) maintaining roads on Corps property to permit smooth traffic flow; (g) routinely cleaning catch basins, drains, and drainage ditches; (h) maintaining launching ramps, swimming beaches, signs, and trails in an orderly manner; (i) routinely removing solid wastes generated by visitors to Lake Red Rock from the administration building and recreational areas; (j) managing and maintaining the wildlife management area by the Iowa Conservation Commission (now the Iowa Department of Natural Resources); and (k) carrying out a forest management program by the Corps to preserve, improve, and maintain healthy trees and cover.

Since filing of the Final EIS, no substantial changes in the aforementioned activities have taken place. Activities (b) and (h) have been required on a more frequent basis than originally anticipated due to damage from near-record precipitation and flood events in the Des Moines River Basin.

The Final EIS summarized findings as follows:

"a. Environmental Impacts: Through the operation and maintenance of Lake Red Rock there will be flood protection to urban and rural areas; low-flow augmentation downstream; periodic disruption and inundation of historical and archaeological sites; long-term economic effect of the local and regional area; and the level of the lake pool will affect ground water levels.

"b. Adverse Environmental Impacts: Periodic inundation of terrestrial habitat between 725 msl and 780 msl; an estimated 4,400 acre-feet of sediment will be deposited in the upper reaches of the lake; seasonal fluctuations in lake levels will result in an unstable environment for aquatic life in the lake and periodic inundation of historical and archaeological sites will probably continue to occur."

The draft SEIS addressed changes in operation and maintenance required as a result of raising the conservation pool from elevation 728 feet NGVD to its 100-year design life elevation of 742 feet NGVD. Pool raises over the life of the project are required to maintain 50,000 acre-feet of conservation storage, the authorized minimum amount. The final SEIS addresses changes in operation and maintenance required as a result of raising the conservation pool from elevation 728 feet NGVD to elevation 734 feet NGVD.

MAJOR CONCLUSIONS AND FINDINGS:

With the exception of cultural impacts and lake levels, and sedimentation, summarized impacts presented in the Final EIS remain unchanged.

Because all of the alternatives originally considered viable would eventually raise the conservation pool elevation to 742 feet NGVD, ultimate impacts (habitat conversion) would be similar among the alternatives. The aquatic resources in the reservoir would be expanded at the expense of periodically flooded terrestrial resources. Boating activities and aesthetics of the reservoir would be enhanced until sedimentation again becomes visible. Also, planning potential for recreational facilities would be improved. Downstream flooding frequency would not change significantly with any pool raise alternative (reference Appendix A - Regulation Evaluation of the Water Control Plan). Some increase in the pool elevation-frequency relationship would result from Alternatives 2, 3, 4, and 7 as compared to Alternative 1 and No Action. Impacts on the pool elevation relationships for Alternatives 2, 3, 4, and 7 would be about the same above elevation 750 feet NGVD. Impacts to other resources in the area would be minimal. All lands affected to elevation 760 feet NGVD are owned by the Federal Government. All other non-federally owned lands to elevation 783 feet NGVD are currently subject to flood easement rights held by the Federal Government.

The District has taken appropriate measures to ensure that significant historic properties are identified prior to any pool raise. American Resources Group, Ltd., (ARG) has completed the National Register evaluations for cultural resources at the Lake. Of the 92 potentially significant sites evaluated by ARG within the impact zone (elevations 728 to 742 feet NGVD), 11 sites below 760 feet NGVD have been determined to be significant. Corps staff archeologists are working with the Iowa State Historic Preservation Officer and the Advisory Council on Historic Preservation to provide for mitigation work (data recovery/excavation) prior to increments of pool raise. Mitigation work is to be completed at all 11 sites (up to 760 feet NGVD) by fall 1988. Mitigation work at sites above 740 feet NGVD will begin in FY88 if funds are available. All mitigation work will be completed before the pool reaches its new maximum elevation of 742/744 feet NGVD.

The projected sediment estimate noted in the Final EIS has been eclipsed. It is now known that in 16 years of operation, 4 percent (79,650 acre-feet) of initial reservoir storage volume has been lost to sedimentation.

Loss of conservation pool capacity due to sedimentation was identified in the draft report as the primary factor driving the pool raise study. Input from some of the public and agencies concerned with land treatment expressed the view that a pool raise is primarily a cosmetic improvement.

While a pool raise may include cosmetic/aesthetic benefits, the additional water storage is required to assure reliability in meeting minimum flow requirements during seasonal dry periods.

The recommended alternative, Plan 7, involves an immediate conservation pool raise to elevation 734 feet NGVD. Any raise beyond 734 feet NGVD will require an agreement with the State of Iowa. The pool raise to elevation 734 feet NGVD was selected for the following reasons:

1. It will preserve a number of options for future resource management.

2. It will permit maximum flexibility with respect to cost-sharing recreational facility relocations with State and local governments.

3. It will preserve more flood control capacity (than higher pools).

Computations show that a conservation pool elevation of 742.0 feet provides adequate low-flow augmentation storage and sediment storage for 100 years of sediment accumulation. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation will be completed.

Regarding land treatment, the Corps of Engineers does not, at this time, have authority to develop, maintain, or enforce non-Federal land treatment measures in the Red Rock watershed. The primary agency responsible for the promotion of land stewardship on non-Federal property is the U.S. Department of Agriculture, Soil Conservation Service (SCS). The SCS, acting through State and regional offices, promotes land treatment practices aimed at erosion control and small watershed protection.

In response to public input, the Corps of Engineers, Rock Island District, has met with local representatives and SCS staff to attempt to resolve the problem of erosion and sedimentation in the Red Rock watershed.

AREA OF CONTROVERSY:

The major opposing public concerns involve the impacts upon flooding frequency of easement lands and upon downstream flooding and erosion. Impacts to downstream properties would be minimal. Impacts upon naturally active processes, such as bank erosion, in which many conditions are factors are difficult to assess. Downstream erosion would likely continue to be an area of controversy. The increased frequency of flooding of easement lands is not significant and therefore does not warrant renegotiation of flowage easements. (Reference page 43 of the Water Control Plan.)

UNRESOLVED ISSUES:

Despite the recommendation of a preferred alternative, the issue remains as to which alternative strikes a balance between all authorized project purposes and the concerns of the interested public.

RELATIONSHIP TO ENVIRONMENTAL PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS:

See Table EIS-1.

TABLE EIS-1

Relationship to Environmental Protection Statutes and Other Environmental Requirements

Statute or Requirement	No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternatives 5 & 6		Alternative 7
FEDERAL STATUTES								
Archaeological and Historic Preservation Act (as amended)	Full	Full	Full	Full	Full	Full	Full	Full
Clean Air Act (as amended)	Full	Full	Full	Full	Full	Full	Full	Full
Clean Water Act (as amended)	Full	Full	Full	Full	Full	Full	Full	Full
Coastal Zone Management Act (as amended)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endangered Species Act (as amended)	Full	Full	Full	Full	Full	Full	Full	Full
Estuary Protection Act	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Federal Water Project Recreation Act (as amended)	Full	Full	Full	Full	Full	Partial	Full	Full
Fish and Wildlife Coordination Act (as amended)	Full	Full	Full	Full	Full	Partial	Partial	Full
Land and Water Conservation Fund Act (as amended)	N/A	N/A	N/A	N/A	N/A	Full	Full	N/A
Marine Protection, Research and Sanctuaries Act	N/A	N/A	N/A	N/A	N/A	Full	Full	N/A
National Historic Preservation Act (as amended)	Full	Full	Full	Full	Full	Full	Full	Full
National Environmental Policy Act (as amended)	Full	Full	Full	Full	Full	Full	Full	Full
Rivers and Harbors Act	N/A	N/A	N/A	N/A	N/A	Full	Full	N/A
Watershed Protection and Flood Prevention Act	N/A	N/A	N/A	N/A	Full	Full	Full	N/A
Wild and Scenic Rivers Act (as amended)	Full	Full	Full	Full	Full	Full	Full	Full
Farmland Policy Protection Act	Full	Full	Full	Full	Full	Full	Full	Full
EXECUTIVE ORDERS AND MEMORANDA								
Flood Plain Management (E.O. 11988)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Protection of Wetlands (E.O. 11990)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Analysis of Prime and Unique Farmlands	Full	Full	Full	Full	Full	Full	Full	Full
LAND-USE PLANS	N/A	N/A	N/A	N/A	N/A	Full	Full	N/A
STATE AND LOCAL POLICIES								
State Endangered Species	Full	Full	Full	Full	Full	Full	Full	Full
Clean Water Act Section 401 Certification	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
~~REQUIRED FEDERAL ENTITLEMENTS~~								
Clean Water Act Section 404 Permit	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

COMPLIANCE CATEGORIES:

a. Full Compliance. Having met all requirements of the statute, E.O., or other environmental requirement for the current stage of planning (either pre or postauthorization).

b. Partial Compliance. Not having met some of the requirements that normally are met in the current stage of planning.

c. Noncompliance. Violation of a requirement of the statute, E.O., or other environmental requirement.

d. Not Applicable. No requirements for the statute, E.O., or other environmental requirement for the current stage of planning.

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR OPERATION AND MAINTENANCE
AT
LAKE RED ROCK, IOWA

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

List of Tables

TABLE OF CONTENTS (Cont'd)

List of Figures

List of Plates

List of Appendixes

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR OPERATION AND MAINTENANCE
AT
LAKE RED ROCK, IOWA

SECTION 1 - NEED FOR AND OBJECTIVES OF ACTION

1.1 STUDY AUTHORITY

1.1.1 The Red Rock Dam and Reservoir was selected and approved as a unit by the following laws in the general comprehensive plan for flood control in the Upper Mississippi Basin. The project was authorized for flood control in Public Law 761, 75th Congress, first session (approved June 28, 1938) and in accordance with Flood Control Committee Document 1, 75th Congress, first session. Recreation and fish and wildlife facilities were subsequently authorized in Public Law 534, 78th Congress (approved December 22, 1974) and Section 111 of the Water Resources Development Act of 1976 (Public Law 94-587).

1.1.2 On January 23, 1986, the Rock Island District received concurrence and guidance from the Office of the Chief of Engineers concerning authority regarding raising the conservation pool elevation.

1.2 PUBLIC CONCERNS

1.2.1 The major concerns of the public are continued flood protection for downstream lands, erosion of the Des Moines River's banks downstream, flooding of upstream easement lands, and recreational uses of the reservoir.

1.2.2 The public is naturally concerned that the main objective of the reservoir, namely flood control, is not compromised by operational changes. The reservoir has provided excellent flood protection for downstream properties. Only one release greater than 30,000 cubic feet per second (ft^3/s) has occurred since the reservoir closing in 1969. During the record flood of 1984, release rates of 40,000 ft^3/s were utilized; however, this release rate was less than inflow during the same period. There is no evidence of increased or decreased bank erosion resulting from operation of the project.

1.2.3 Flooding frequency of easement lands during the 16-year period of 1969-1984 has been greater than anticipated. This has added to the concern of easement landowners that a conservation pool increase will cause increased flooding of the easement lands.

1.2.4 The recreational potential of the reservoir is of concern to the State, the general public, and businesses in the area. Mainly because of sedimentation, the current condition of the reservoir at normal pool limits hunting, fishing, and boating and detrimentally affects aesthetics of the area.

1.3 PLANNING OBJECTIVES

The objective is to develop a practical and acceptable long-term operation plan which meets the original design goals of the reservoir, namely providing flood control while maintaining a minimum conservation storage of 50,000 acre-feet. By developing a long-term plan, the objectives of the reservoir can be met and further resource planning in the area can be optimized.

SECTION 2 - PROJECT ALTERNATIVES

2.1 INTRODUCTION

2.1.1 The U.S. Army Corps of Engineers, Rock Island District, originally proposed to increase the normal operating pool at Lake Red Rock from the present 728 feet NGVD elevation to 742 feet NGVD during the period from 1988 to 2069. The purposes of this proposed pool raise were to provide adequate water storage in a conservation pool, along with additional sediment storage capacity and recreational opportunities, while continuing to provide the required flood control capability. Elevation 742 feet NGVD represents the anticipated elevation required at the end of a 100-year project life to provide 50,000 acre-feet of conservation pool. However, following additional review, the final recommendation is implementation of a one-step conservation pool raise to elevation 734 feet NGVD, with a 2-foot fall pool raise for migratory waterfowl. As noted in the SEIS abstract, the recommendation recognizes that storage at elevation 734 will be reduced in the future if current sedimentation rates persist.

2.1.2 The proposed pool raise could potentially alter available ecological resources soil characteristics, water quality, and cultural resources within the project area. In addition, hydrologic regimes would change to some degree. Federal and State land-use changes also would result within the reservoir, as would the potential recreational usage and the number and location of recreational and public use facilities.

2.1.3 The water control plan preceding this document describes the proposed pool raise alternatives in detail as well as the existing project operations and environment. This document addresses the potential environmental effects associated with the proposed pool raise.

2.2 PRESENT OPERATIONS/HISTORICAL RECORD

2.2.1 At present, Lake Red Rock operates with a normal operational, or conservation, pool elevation of 728 feet NGVD, with a 2-foot pool raise (to 730 feet) during the fall waterfowl season (September 15 to December 15). Allowable maximum discharge is 18,000 ft^3/s during the growing season (April 21 to December 15) and 30,000 ft^3/s during the non-growing season (December 16 to April 20). The minimum discharge is regulated in order to maintain a minimum flow of 300 ft^3/s at Ottumwa.

2.2.2 The original normal operational pool was 725 feet NGVD. The pool raise to 728 feet NGVD was implemented in September 1977 and has been in effect since that time. According to the current plan of operation, the normal pool should be raised to 733 feet NGVD in 1994 to restore the 90,000 acre-feet originally approved. This capacity is divided into 50,000 acre-feet for water conservation and 40,000 acre-feet for sediment storage.

2.2.3 The fee title area for the project generally includes lands up to elevation 760 feet NGVD. Flowage easements have been obtained for lands between elevations 760 and 783 feet NGVD.

2.2.4 Recorded water levels within Lake Red Rock have been higher than projected in the original project plans. This is due to above-normal precipitation during the period since impoundment.

2.2.5 These water levels have resulted in post-flood zones of unvegetated slopes, to varying elevations, known as "bathtub rings." The bathtub ring effect represents impacts to vegetation, geology and soils, cultural resources, water quality, and aesthetics between elevation 728 feet NGVD and a given year's flood height elevation.

2.2.6 The duration of the bathtub ring depends on the period of time during the growing season that water levels remain high. Generally, the period of flooding ends with sufficient time for some recolonization by annual forbs. Also, as water levels permit, the Iowa Department of Natural Resources (IDNR) has attempted aerial seeding of lower elevations and mudflats to provide food for migratory waterfowl.

2.2.7 The past and future use of Lake Red Rock for flood control will continue to impact resources between the current conservation pool elevation and elevation 783 feet NGVD. Therefore, terrestrial habitat value between the current and the ultimate conservation pool may be considered marginal due to repeated and lengthy inundation during the growing season.

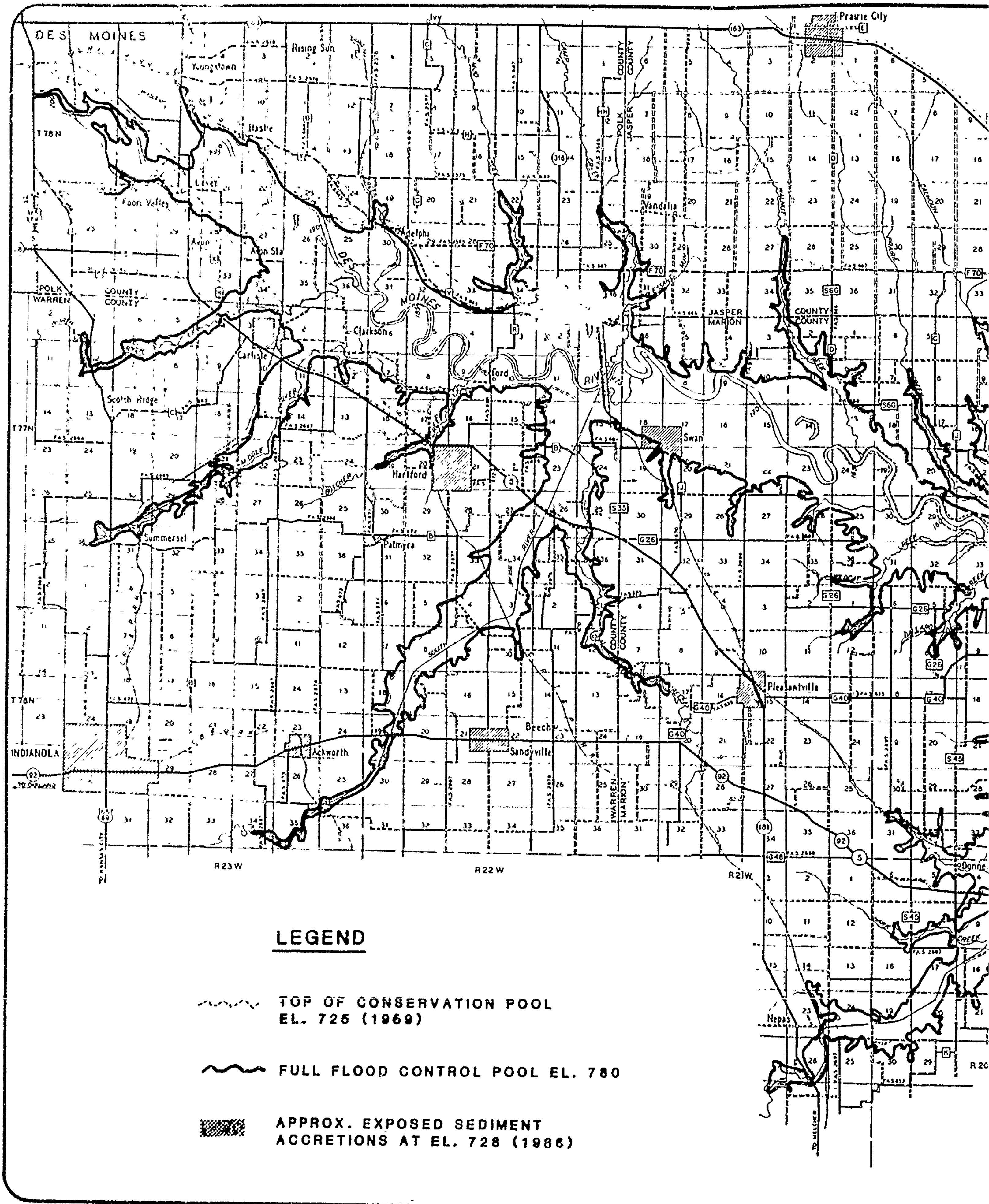
2.2.8 Upper portions of the reservoir, near Swan Wildlife Refuge and into Polk, Warren, and Jasper Counties, retain the habitat characteristics of a typical Midwestern riverine system. While these areas were heavily flooded during the last 6 years, the impacts of flooding are less pronounced than for reservoir areas below elevation 750 feet NGVD.

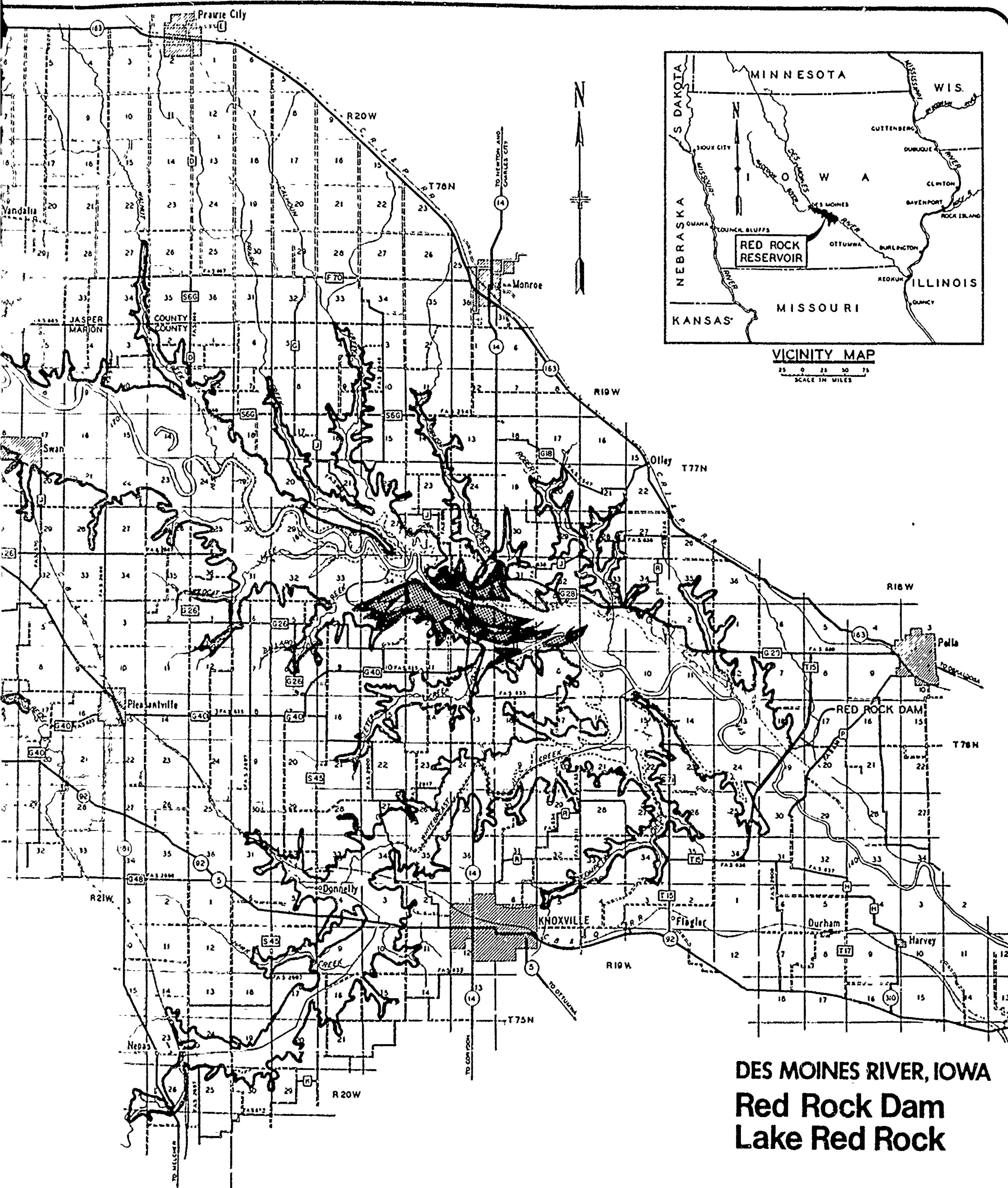
2.2.9 In addition to the higher than anticipated overall pool levels since impoundment, the sediment entrapment has been higher than originally anticipated, resulting in a higher rate of sedimentation and a more rapid loss of flood storage capacity. The original project plan estimated entrapment efficiency of about 75 percent. However, since impoundment, the annual entrapment efficiency has generally been 90 percent or greater. In addition, the percentage of sediment accumulation below 730 feet NGVD is greater than anticipated, thereby impacting the conservation pool to an even larger extent (Figure EIS-1).

2.3 PLANS ELIMINATED FROM FURTHER STUDY

2.3.1 Seven alternatives have been considered relative to this proposed pool raise. Of these, two are not considered feasible.

2.3.1.1 Alternative 5 - Dry Pool. Under the dry pool alternative, the reservoir would return to a riverine system, except when storing floodwaters. The Des Moines River would be allowed to return to its banks under normal conditions. The operating structures at the dam would be kept open, and there would be no routine ponding behind the dam. The dam only would be used when the Des Moines River was experiencing flood conditions. At those times, the dam would be put into operation and floodwaters would be stored only for the flood event. Water would be gradually released until the river returned to its normal flow, at which time the dam would be taken out of operation. There would be no conservation pool or lake-based recreation.


DES MOINES
Ivy
Prairie City
Rising Sun
Youngstown
Hastie
Lever
Avon
Avon Sta
Adelphi
Vandalia
POLK COUNTY
JASPER COUNTY
POLK
WARREN
COUNTY
COUNTY
JASPER
MARION
COUNTY
COUNTY
DES MOINES
Clarkson
Carlisle
Ford
RIVER
Scotch Ridge
Swan
Hartford
Summerset
Palmyra
Pleasantville
Beech
Sandyville
Ackworth
INDIANOLA
WARREN
MARION
Nepas
Donnel
T 78N
T 77N
T 76N
R23W
R22W
R21W
LEGEND
TOP OF CONSERVATION POOL EL. 725 (1969)
FULL FLOOD CONTROL POOL EL. 780
APPROX. EXPOSED SEDIMENT ACCRETIONS AT EL. 728 (1986)



DES MOINES RIVER, IOWA

Red Rock Dam
Lake Red Rock

GENERAL LOCATION

FIGURE EIS-1

2.3.1.2 Alternative 6 - Dredging. The sediment stored in the reservoir would be dredged and removed to high ground outside of the maximum flood pool. This alternative would involve general dredging in the conservation pool which would be accomplished to remove sediment from the flood pool. Sediment from general dredged areas would require physical removal from the flood pool and placement in upland disposal sites. The anticipated cost of dredging alone is over $710 million. (Reference page 53 of the Water Control Plan.)

2.3.2 These two alternatives will not be evaluated further in this document and are represented only in tables EIS-1 and 2. Alternative 5 is considered infeasible due to conflict with authorized project purposes for hydropower, fish and wildlife, and recreation. Alternative 6 is considered infeasible due to anticipated costs associated with dredging, disposal, transport, and other handling of massive quantities of sediment.

2.4 PLANS CONSIDERED IN DETAIL

2.4.1 The remaining alternatives apply to the originally proposed implementation of an elevation 742 feet NGVD conservation pool, and the currently proposed single-step raise to elevation 734 feet NGVD. These are summarized below:

2.4.1.1 No Action. This alternative involves no change in the base condition. The base condition is the current operating plan, also known as 90/50. That being, 50,000 acre-feet for conservation storage plus an additional 40,000 acre-feet for sediment storage (90,000 acre-feet total). This was the case in 1969 when the dam was put into operation. The conservation pool is maintained at a constant elevation (such as 728, etc.) until the sediment storage allotment is lost to siltation (conservation pool volume down to 50,000 acre-feet). At this point, the conservation pool elevation is raised high enough to gain a new 40,000 acre-foot sediment storage allotment. No pool raises would occur for several years, and these would be limited to no more than 5 feet each raise.

2.4.1.2 Alternative 1, Current Plan of Operation With Improved Regulation (Plan 1). The current plan of operation with improved regulation (discharge rates) involves maintaining the existing program of raises to periodically recover the 40,000 acre-foot sediment storage allotment lost to siltation. In addition, slightly greater discharge rates would be allowed than for the base condition for periods when water is stored on easement lands above elevation 760 feet NGVD during the growing season. Also, the non-growing season would be extended from April 20 to April 30. The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the IDNR.

Projected pool raise steps:

Period	Design Life (Years)	Conservation Pool (NGVD)	Permanent Fall Pool (NGVD)
1984-1994	10	728	730
1994-2019	25	733	735
2019-2044	25	738	740
2044-2069	25	742	744

2.4.1.3 Alternative 2, One-Step Pool Raise (Plan 2). The one-step alternative is for a near-term raise to elevation 742 feet NGVD. The conservation pool could be raised as early as the year 1989 provided that necessary construction work were completed by that time. The raise could be implemented upon completion of the construction or modification of several boat ramps, beaches, and bridges and the recovery of significant archeological sites. The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the IDNR.

Projected pool raise steps:

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1989	5	728	730
1989-2069	80	742	744

2.4.1.4 Two-Step Pool Raise (Plan 3). This was the originally recommended plan and would feature an immediate raise to elevation 736 feet NGVD and a final raise to elevation 742 feet NGVD. The intermediate step to elevation 736 feet NGVD could be physically accomplished with no structural modifications following completion of ongoing archeological investigations. The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the IDNR.

Projected pool raise steps:

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1987	3	728	730
1987-1999	12	736	738
1999-2069	70	742	742

2.4.1.5 Alternative 4, Three-Step Pool Raise (Plan 4). The three-step plan would involve immediately raising the pool to elevation 732 feet NGVD with subsequent raises to elevations 736 and 742 feet NGVD. The intermediate step to elevation 732 feet NGVD could be physically accomplished with no structural modifications. The conservation pool would be raised 2 feet in the fall for the benefit of migrating waterfowl in coordination with the IDNR.

Projected pool raise steps:

Period	Design Life (Years)	Conservation Pool (NGVD)	Fall Pool (NGVD)
1984-1987	3	728	730
1987-1994	7	732	734
1994-2004	10	736	738
2004-2069	65	742	744

2.4.1.6 Alternative 7, Preferred Plan. This alternative involves an immediate raise to elevation 734, with a 2-foot fall pool raise for migratory waterfowl. The conservation pool could be raised as early as the fall of 1988, provided that flows are adequate during that period.

The pool raise to elevation 734 feet NGVD was selected for the following reasons:

1. It will preserve a number of options for future resource management.

2. It will permit maximum flexibility with respect to cost-sharing recreational facility relocations with State and local governments.

3. It will preserve more flood control capacity (than higher pools).

2.4.1.7 Further pool raises to elevation 742 feet NGVD are not part of the recommended plan. However, computations show that a conservation pool elevation of 742.0 feet provides adequate low-flow augmentation storage and sediment storage for 100 years of sediment accumulation. Prior to any further increase in the pool elevation, the necessary technical studies, local cooperation agreement, and environmental documentation will be completed.

2.5 INCIDENTAL ACTIONS

2.5.1 Changes in operation and maintenance anticipated for Lake Red Rock at elevation 742 feet NGVD would include modifications of several access points and recreation areas around the reservoir. These modifications will be required sooner or later regardless of the finally selected pool raise alternative and can be considered part of the future "without" condition. Effects of these modifications, which are summarized in Section 4.1.4; are discussed in the following paragraphs.

2.5.2 North Overlook Beach. This action requires relocation of the beach and parking lot to higher elevations immediately adjacent to the existing facility.

2.5.3 <u>East Wallashuck Boat Ramp</u>. This action requires modification of the existing roadway into a boat ramp and relocation of the parking lot to higher elevations adjacent to the East Wallashuck campground.

2.5.4 <u>West Wallashuck Parking Lot</u>. The lowest of the three existing parking lots will be abandoned and a roadway connecting the middle lot to the upper lot will be constructed.

2.5.5 <u>Whitebreast Beach and Boat Ramp</u>. The existing beach and access road will be abandoned and relocated immediately south on an existing natural beach area. An unserviceable boat ramp will be abandoned and a new ramp constructed between the relocated beach and the abandoned access road. A bicycle path will be provided between the parking lots for the new ramp and beach areas. The bicycle path would cross a proposed impoundment structure for a small fishing pond in the upper reaches of a small ravine.

2.6 COMPARATIVE IMPACTS OF ALTERNATIVES

Table EIS-2 presents a summary of the effects for the various alternatives. Section 4 presents more detailed discussion of alternative effects.

TABLE EIS-7 (Cont'd)

Category	No Action	Higher Releases Alternative 1	1-Step Alternative 2	2-Step Alternative 3	3-Step Alternative 4	Dry Pool Alternative 5	Dredging Alternative 6	1-Step (734) Alternative 7
Employment and Labor Force	This alternative would not directly affect the permanent employment or labor force of the Marion County area.	Same as No Action.	Same as Alternative 1, plus increased commercial development might result in new jobs and higher employment rates.	Same as Alternative 1.	Same as Alternative 1.	This alternative would result in the loss of many jobs associated with recreation and tourist interests.	No impact.	Same as Alternative 3.
Displacement of Farms	This alternative would not require the displacement of any farms. However, following a raise in pool elevation, some farmland would have minor increases in flooding probabilities.	Same as Alternative 1.	Same as No Action.	Same as No Action	Same as No Action.	This alternative would not require any displacement of farms. Some farmland would have minor decreases in flooding probabilities.	No impact.	Same as Alternative 3.
Manmade Resources	No action would leave certain lake access points unusable. Mudflats would remain visible until each storage-recovery raise.	Same as No Action.	Could compromise certain access areas until rebuilt. Mudflats inundated but accretion would begin upstream. This alternative may negate further opportunity for pool raises during project life.	Initial step would immediately improve all access points. Mudflats inundated but accretion would begin upstream. This alternative provides for one more pool raise to cover accreted mudflats.	Same as Alternatives 1 and 2.	This would eliminate the lake as a man-made resource.	See preceding and following headings.	Same as Alternative 3, first step.
Natural Resources	Existing vegetation-habitat per elevation relationships would remain until each storage-recovery raise. Newly flooded areas would provide aquatic diversity until again lost to sedimentation.	Not anticipated to significantly change from No Action. Could improve terrestrial conditions. May reduce availability of flooded habitat for spawning and nursery.	Could stabilize deepwater and main lake benthic areas during most of project life, until accretion moves downstream. Terrestrial habitat replaced by aquatic until sedimentation emerges as mudflats.	Should improve deep-water and shallow water until accretions reappear near bridge.	Same as Alternatives 1 and 2.	It is anticipated that the lake bed would return to a typical riverine bottomland subject to periodic inundation unless the land is leased for agriculture.	Probable major impacts to water quality from sediment resuspension in the water column. Disposal of dredged material could affect habitat outside of reservoir.	Same as Alternative 3, first step.
COSTS: First Cost 1/ Net Benefits B/C Ratio	No Action Condition (Existing Condition)	0 $20,100 Infinite	$1,441,200 $195,500 2.6	$1,467,000 $159,400 2.3	$903,700 $169,600 3.2	Not applicable, unacceptable alternative	$720,000,000 overwhelmingly infeasible	$1,467,000 $128,500 2.0

1/ Represents estimated costs of implementation, discounted to base year.

TABLE EIS-2

Summary of Environmental Impacts

Category	No Action	Higher Releases Alternative 1	1-Step Alternative 2	2-Step Alternative 3	3-Step Alternative 4	Dry Pool Alternative 5	Dredging Alternative 6	1-Step (734) Alternative 7
Displacement of People	This alternative would not necessitate any relocations.	Same as No Action.	Same as No Action.	Same as No Action.	Same as No Action.	Same as No Action.	Same as No Action.	Same as Alternative 3.
Noise	Same as Alternative 1.	Construction machinery would generate a temporary increase in noise during scheduled fabrication of facilities. This increase would create a minor, short-term disturbance to recreationists at the lake.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.	Noise levels in the area would be characteristic of a rural setting.	Machinery used in the dredging process would generate a noticeable increase in noise for a period of much longer duration than that associated with other alternatives. This increase would adversely affect the recreation experience of boaters and others.	Same as Alternative 3.
Aesthetic Environment	Improved aesthetics due to periodic wetland coverage of a larger lake surface. Magnitude of impact affected by schedule of implementation.	Same as No Action.	Same as No Action, plus quickest aesthetics improvement due to scheduling.	Same as No Action.	Same as No Action.	Greatly altered aesthetics due to diminished lake area until revegetation and potential return to riverine bottomland forest, or could be leased for agriculture with subsequent farmland appearance.	Great impact from machinery/equipment activity in the lake, stockpiling freshly dredged material, and turbidity in the reservoir. See above comment under "Noise."	Same as No Action.
Public Facilities and Public Services	Same as Alternative 1.	This alt[illegible] would enhance [illegible]tion experie[illegible] lake by improvi[illegible]ice, boating, [illegible]d wildlife habitat and would help to fulfill part of the recreational needs of south-central Iowa. Recreation at various facilities would be temporarily disrupted during the construction phase.	Same as Alternative 1. A fast pool raise would more quickly provide the maximum enhancement of the pool for recreation purposes.	Same as Alternative 1.	Same as Alternative 1.	Creation of a dry reservoir would greatly reduce the recreational boating opportunities in south-central Iowa. Boaters and other recreationists within the affected area would be forced to use other recreation areas, leading to possible overcrowding at those other sites.	Noise generated by dredging equipment would adversely affect the recreation experience at the lake. Boaters would likely avoid the areas of the lake where dredge equipment was being operated; in effect, the dredging process would reduce the area of the lake utilized by recreationists. Dredging would provide a more safe boating experience.	Similar to Alternative 1.

TABLE EIS-2 (Cont'd)

Category	No Action	Higher Release Alternative 1	1-Step Alternative 2	2-Step Alternative 3	3-Step Alternative 4	Dry Pool Alternative 5	Dredging Alternative 6	1-Step (714) Alternative 7
Property Values and Tax Revenues	Same as Alternative 1.	This alternative could slightly increase property values of residential properties but could adversely impact the values of farm properties. Tax revenues would be impacted accordingly. Magnitude affected by time schedule of implementation.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.	This alternative would negatively impact the value of residential properties by reducing recreational opportunities in the area and eliminating the aesthetic appeal of the lake itself. Farm properties in the easement area could increase in value as the threat of flooding would be reduced.	No impact.	Same as Alternative 1.
Community and Regional Growth	Same as Alternative 1.	This alternative could slightly increase community growth; the increased potential for recreation visitors to the lake could attract new businesses to the area and create new employment opportunities. No effect on regional growth would result.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.	Possible adverse effect upon community and regional growth, as greatly reduced recreational potential could make the area less attractive to business and residents.	No impact.	Same as Alternative 1.
Community Cohesion	No effect on community cohesion would result due to the limited residential development in the pool vicinity. Area farmers are opposed to any pool raise because they perceive an increased risk of flooding resulting from any raise in pool elevation.	Same as No Action.	Same as No Action.	Same as No Action.	Same as No Action.	This alternative would adversely impact community cohesion by eliminating a recreation resource which is highly valued by the public.	No effect on community cohesion would result because of limited residential development in the pool vicinity.	Same as No Action.
Business and Industrial Activity	Changes in business and industrial activity would be slight. No businesses would be displaced.	Same as No Action.	Same as No Action, plus land in the pool vicinity might become more attractive for commercial development.	Same as Alternative 1.	Same as Alternative 1.	This alternative would adversely impact area businesses by reducing the number of recreationists and tourists to the area; however, potential agricultural leasing could create minor stimulus.	No impact.	Same as Alternative 1.

SECTION 3 - AFFECTED ENVIRONMENT

3.1 GENERAL DESCRIPTION OF STUDY AREA

The study area involves a portion of the Des Moines River Basin in south-central Iowa, and includes the authorized flood control pool upstream of Red Rock Dam, as well as the Des Moines River from the dam to its confluence with the Mississippi River (142.9 river miles). Whereas the currently authorized conservation pool (728 feet NGVD) is located entirely within Marion County and originally covered roughly 10,500 acres, the flood control pool (780 feet NGVD) extends into Warren, Jasper, and Polk Counties, covering 65,500 acres, and reaches over 33.5 valley miles upstream from the dam (Figure EIS-1). In addition to the conservation pool, the study area included flowage easements up to 783 feet NGVD. This study focused primarily on Lake Red Rock and upstream areas, since these areas would be most affected by the pool raise. The Des Moines River downstream was studied less intensely because of the identification of limited impacts to the environment, i.e., the pool raise would result in little change in downstream flow conditions. (Refer to Appendix A - Regulation Evaluation of the Water Control Plan.)

The study area lies in the North American Central Lowland Physiographic Province, where geomorphology and drainage were greatly influenced by Pleistocene glaciation. The physiography and topography along the Des Moines River Basin reflect the depositional landforms and clastic debris from continental ice sheets of the Kansan and Wisconsinan Glacial Stages and the subsequent modification of those deposits by agents of erosion. The surface topography varies from hummocky, pitted terrain in the northwest to steeply rolling hills with upland flats and stream bottomlands in the southeast.

3.1.1 DES MOINES RIVER BASIN

3.1.1.1 The Des Moines River Basin has an average width of 40 miles and extends 360 miles from its headwaters north of Slayton, Minnesota, to its confluence with the Mississippi near Keokuk, Iowa. The river is a meandering stream formed in glacially-derived sediments with the valley floor and walls cut into Pennsylvanian and Mississippian strata. Downstream of its confluence with the Raccoon River (near Des Moines, Iowa), the river valley changes in both direction and character in passing from the Des Moines Lobe into the Southern Iowa Drift Plain. North of this point, valley morphology is characterized by a shallow valley with steep walls and a narrow floodplain. South of this point, the river turns southeasterly and flows in a broader, more mature floodplain. The valley is considerably wider and deeper, and surrounding bluffs are more rounded. The study area lies in this more mature floodplain.

3.1.1.2 The Des Moines River drains an area in excess of 14,500 square miles and is fed by 33 principal tributaries. Within the confines of the study area, five principal tributaries join the river. The tributaries drain slightly more than 5,100 square miles. The total drainage area above the dam is 12,323 square miles.

3.1.1.3 The Des Moines River flows 142.9 miles from the Red Rock Dam to the Mississippi River. In that reach, the average gradient is 1.6 feet per mile.

3.1.2 CLIMATE

3.1.2.1 The climate of this area is continental, characterized by marked seasonal contrasts of cold, dry winters and relatively warm, humid summers. Annual precipitation ranges from 31.74 inches at Des Moines to 32.99 inches at Knoxville and 33.04 inches at Pella (NOAA, 1985; NOAA, 1975). Figure EIS-2 illustrates the mean annual precipitation distribution in this general area.

3.1.2.2 About one-third of the precipitation in the study area is attributed to moist air transported from the Gulf of Mexico by regional weather patterns. The remainder is attributed to evapotranspiration.

3.2 ECOLOGICAL RESOURCES

3.2.1 TERRESTRIAL BIOTA

3.2.1.1 Terrestrial Flora

3.2.1.1.1 Terrestrial vegetative communities within the Lake Red Rock and Des Moines River project area range from developed lands (urban, suburban, recreational) to relatively mature forested areas. Agricultural land is the dominant type within the project area. Also present are forests (upland and bottomland), grasslands, oldfield/savanna communities, and wetlands (appendix B, tables B-1 and B-2).

3.2.1.1.2 Vegetation in the reservoir area is strongly influenced by operation of the lake for flood control. During the 1984 flood, over 80 square miles of the Des Moines River Valley were inundated. Effects were most pronounced at elevation 750 feet NGVD and below. Near the main lake body new sediment accretions buried previous ground cover and provided larger mudflats for annual forb colonization.

3.2.1.1.3 Woody vegetation is extremely limited between the current conservation pool and elevation 750 feet NGVD due to frequent inundation during less severe flood events. While the upper reservoir near Carlisle retains some original bottomland forest components of silver maple and box elder, the lower reservoir currently contains willow scrub and recent box elder, cottonwood, and silver maple seedlings. Other vegetation consists of pioneer annual forbs such as smartweed, ragweed, dock, and pigweed.

3.2.1.1.4 Elsewhere in the Red Rock area forested lands are primarily found in areas of steep relief and along waterways and drainageways. Agricultural lands and grasslands dominate the uplands and areas of reduced relief. The old field/savanna habitats are scattered throughout the project area but are most common in abandoned agriculture and pasture lands, along railroad and highway rights-of-way, and in areas of recent physical disturbance.

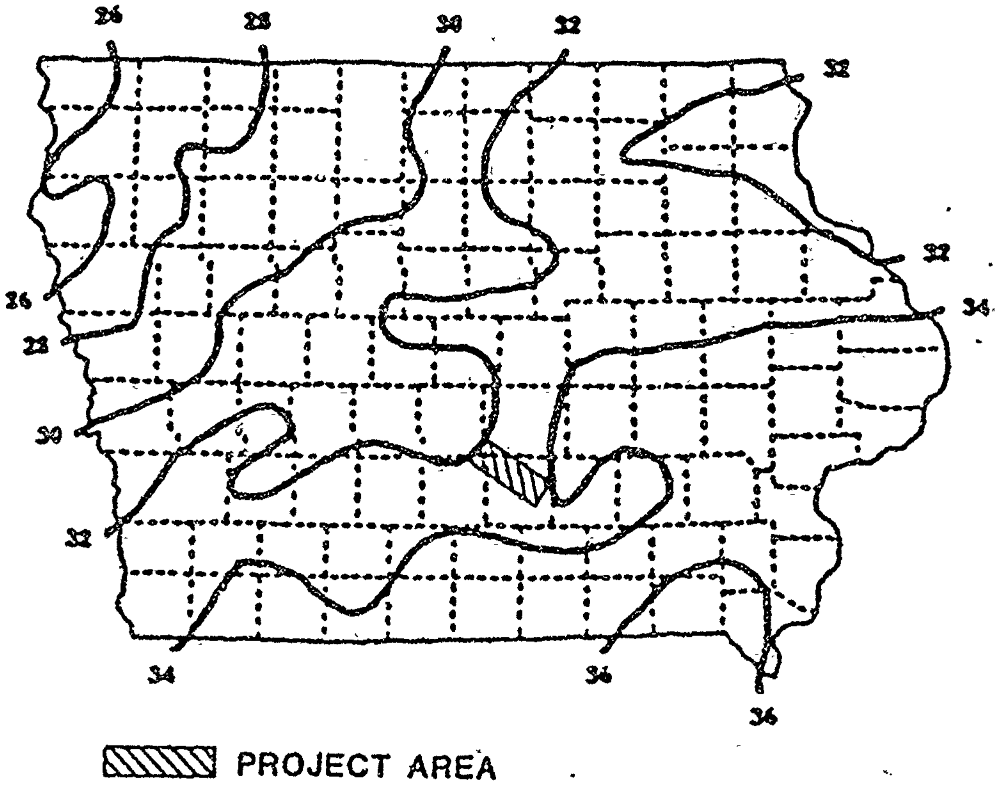


Figure EIS-2
MEAN ANNUAL PRECIPITATION IN INCHES
FOR IOWA

3.2.1.1.5 Within the project area, vegetated wetlands are generally the palustrine forested type and are confined to the margins and upper zones of Lake Red Rock and to isolated pockets within the Des Moines River floodplain. Farm ponds and small impoundments within the project area also contain wetland habitats. In addition, approximately 1,000 acres of wetlands (moist soil units) artificially maintained by pumping are located in the Swan Wildlife Refuge, operated by the IDNR. These units include agricultural lease areas and are seeded with Japanese millet, sorghum, and corn to provide food for fall waterfowl. Special aquatic site wetlands are represented by mudflats within the reservoir and are typically aerially seeded with millet as water levels permit.

3.2.1.1.6 Appendix B, table B-3 presents compartmental data on the terrestrial communities within the project area and provides some information on distribution and abundance. Appendix B, tables B-1 and B-2 provide specific current quantitative information on the average of each habitat within the Fee Title Lands and Easement Zones, respectively. Forb land is the predominant habitat type, comprising 90 percent of the land below elevation 736 and more than 70 percent of the land area below 743.

3.2.1.2 Terrestrial Fauna

3.2.1.2.1 A diverse complex of mammals, birds, and herpetofauna are known to occur within the Lake Red Rock and Des Moines River project area. Limited quantitative investigations have been conducted, but considerable qualitative information is available. Appendix B, tables B-4 through B-6 summarize current information regarding common mammals, birds, and herpetofauna potentially occurring in the project area.

3.2.1.2.2 Although a large variety of mammals, birds, and herpetofauna are known to occur within the project area (as either residents or migrants), certain species are common and widely distributed within the project area.

3.2.1.2.3 Common mammals include raccoon, fox squirrel, white-tailed deer, eastern cottontail, opossum, mice, voles, shrews, muskrat, red fox, coyote, and striped skunk. Other mammals are not as widely distributed but may be common in isolated habitats or areas (appendix B, table B-4).

3.2.1.2.4 Due to fluctuations in the reservoir, terrestrial fauna is frequently displaced to surrounding areas. As an example, during the 1984 (flood of record) spring-fall period, the reservoir pool elevation rose from 728 feet NGVD in early April, to 760 in mid-May, to 779 in June. The reservoir did not return to elevation 730 feet NGVD until the end of August. Therefore, most of reservoir was unavailable for use by terrestrial species during the average nesting, brooding, or nursing period.

3.2.1.2.5 The most recent flood event, during fall 1986, resulted in a pool peak elevation of 757 feet NGVD (late October), with elevations of 736 or greater from late September to late November. Therefore, resident wildlife within the proposed pool raise zone was limited through the winter and early spring of 1987.

3.2.1.2.6 A considerable number of bird species is known within the project area (appendix B, table B-5). Those most widely distributed and abundant include bobwhite, ring-necked pheasant, killdeer, rock dove, mourning dove, belted kingfisher, common flicker, eastern kingbird, barn swallow, bluejay, common crow, black-capped chickadee, tufted titmouse, brown thrasher, American robin, starling, house sparrow, meadowlark, redwing blackbird, common grackle, brown-headed cowbird, cardinal, indigo bunting, and American goldfinch. Certain avian groups may be common during migration periods or in isolated habitats. This would include a number of warbler species during spring and fall migration and waterfowl (ducks, geese) during fall stopovers.

3.2.1.2.7 The herpetofauna of the Lake Red Rock and Des Moines River project area inhabit a wide variety of terrestrial and semi-aquatic and aquatic habitats (appendix B, table B-6). While a majority of herpetofauna are not frequently observed (as compared to abundant birds and mammals), several species are common within the project area: American toad, spring peeper, chorus frog, cricket frog, bullfrog, pickeral frog, northern leopard frog, snapping turtle, map turtle, smooth softshell, water snake, garter snake, fox snake, bull snake, and king snake.

3.2.2 AQUATIC BIOTA

3.2.2.1 Classification of Lake Red Rock using U.S. Fish and Wildlife Service criteria (Cowardin et al. 1979) is as follows: System lacustrine; Subsystem limnetic and littoral; Class unconsolidated bottom and unconsolidated shore; Subclass mud; Water Regime permanently flooded and semi-permanently flooded; Water Chemistry fresh, Special Modifier impounded.

3.2.2.2 Sediment cross sections developed periodically by the Rock Island [illegible]trict indicate that the limnetic subsystem, that is, water about 6 feet [illegible]eper, is confined to the main lake body roughly from Whitebreast Point [illegible]e dam. From the western shore of the Whitebreast embayment upstream, [illegible] lake body is about 5 to 3 feet deep, eventually becoming less than [illegible] deltaic mudflats at about 6 miles upstream from the dam. At elevation [illegible] feet NGVD, therefore, over one-third of the main lake body would now be classified as a littoral subsystem. With all embayment areas included, about one-half of the lake may be considered shallow water or littoral aquatic habitat at the current conservation pool.

3.2.2.3 In a relatively stable lake, the littoral zone would be expected to display aquatic vegetation such as American lotus, potamogeton species (pondweed), coontail, and wild celery. Shoreline areas would display cattail arrowhead, smartweed, and sedges. However, due to length and duration of flood events at Lake Red Rock, the littoral zone at elevation 728 feet NGVD becomes limnetic deep water, and any colonizing aquatic plant species have been and probably will be killed off, except during drier periods over the life of the project.

3.2.2.4 Fish Resources

3.2.2.4.1 The fisheries of the Des Moines River and Red Rock Reservoir are generally characteristic of large, slow-moving Midwestern rivers. The fisheries are dominated by non-game species such as buffalo, carp, river carpsucker, and drum. Commercial fishing in Red Rock Reservoir between 1975 and 1985 averaged a total catch return of 490,000 pounds of these rough fish per year. Buffalo are the major fish caught by commercial fishermen, representing 80 to 90 percent of the total catch. Trammel nets and gill nets are the principal gear used (Lake Red Rock Operational Management Plan, 1986).

3.2.2.4.2 The predominant game fish in Red Rock Reservoir are largemouth bass, crappie, white bass, and channel catfish. These species have shown to be capable of reproducing and sustaining fishable populations.

3.2.2.4.3 Several factors have limited the development of a sport fishery at Lake Red Rock. Fish spawning has not been as successful as first hoped. Settling of waterborne sediments in prime spawning areas has been the major cause. Spawning success has been best when high water occurred during the spawning season. This increases the amount of suitable spawning habitat as the littoral zone becomes significantly expanded (Lake Red Rock Operational Management Plan, 1986; Iowa Conservation Commission, 1983 and 1985). In addition, habitat and cover diversity are very limited, especially in the main body of the reservoir and tributary coves.

3.2.2.4.4 There is a very limited fishery management program at Lake Red Rock, presently consisting only of stocking northern pike and walleye. However, largemouth bass were stocked prior to 1975. The IDNR has stocked northern pike and walleye almost every year. Because reproductive success for these fish has been limited, restocking will probably continue. Northern pike require inundated vegetation for successful spawning, and walleye need clean substrates for a productive hatch. Plans exist for a stocking program of "wipers" (striped bass x white bass hybrids), but not enough stock is presently available (Lake Red Rock Operational Management Plan, 1986).

3.2.2.4.5 The most recent fish surveys by IDNR at Lake Red Rock have indicated an improving game fishery, especially bluegill, white bass, black crappie, and white crappie (table EIS-3). Large numbers of young-of-the-year (YOY) of these species have been observed during recent surveys. The major factor influencing the improved reproductive success is thought to be the continuing high reservoir levels during spring spawning periods for the last several years. These higher water levels provide an increased area of suitable spawning habitats and nursery zones, as well as reduce reproductive loss due to the exposure of eggs and larvae resulting from a sudden drop in water level.

3.2.2.5 Benthic Invertebrates

3.2.2.5.1 The benthic invertebrate community of Lake Red Rock is generally dominated by *Oligochaeta*, *Chironomidae*, and *Chaoborus*. This is typical of lakes and reservoirs having predominantly soft silt, clay substrates. A

TABLE EIS-3

Results of August 1986 Fisheries Survey (IDNR) at Lake Red Rock (Fyke Net and Electrofishing Results Combined)

Species	Total Number	Relative Frequency	Range in Length (inches)	$\bar{X}$ Length (inches)
Bluegill	93	17.8%	3.4- 6.6	4.8
Black crappie	118	22.6%	6.0-12.0	8.8
White crappie	193	37.0%	4.8-13.8	8.4
Channel catfish	47	9.0%	7.8-26.2	15.0
Flathead catfish	11	2.1%	9.6-45.0	18.0
Largemouth bass	39	7.5%	6.8-17.0	12.0
Northern pike	2	0.4%	23.2-25.4	24.3
Walleye	7	1.3%	6.4- 8.0	7.3
White bass	12	2.3%	7.0-15.0	9.8
TOTAL	522			

Source: Iowa Department of Natural Resources, 1986.
ESE, 1986.

1987 investigation (Keith, 1971) found Chaoborus to be the dominant taxa. A similar investigation in 1972 (Hoekstra 1973) found that Oligochaetes were most abundant, followed by Chironomids and Chaoborus.

3.2.2.5.2 As Lake Red Rock has developed, benthic invertebrate densities have generally increased. However, densities remain significantly lower than in most other Midwestern reservoirs and lakes (Keith 1971; Hoekstra 1973). Densities have generally been greatest in the upper portions of the lake, declining with increasing depth and proximity to the dam. Factors which have been found to limit benthic abundance include the relatively low organic content of the sediments (detritus, particulate organic matter) and the low retention time (Keith 1971; Hoekstra 1973).

3.2.2.6 Phytoplankton

3.2.2.6.1 The phytoplankton of the Des Moines River is typical of big river systems. Winter and spring months are usually dominated by diatoms such as Cyclotella, Stephanodiscus, Diatoma and Melosia. Green algae growth increases through the summer months as temperature increases and depletion of silica limits diatom growth. Common green algae in the Des Moines River are Ankistrodesmus, Actinastrum, Scenedesmus, Pediastrum and Chlamydomonas. Bluegreen algae such as Oscillatoria, Microcystis, and Anabaena are present during the summer months but usually not abundant. Dinoflagellates are often common for a short time in later summer.

3.2.2.6.2 Many factors influence phytoplankton composition in big river/reservoir systems. Most important of these are nutrient availability, light penetration (turbidity), water temperature, flow rates, and location relative to the reservoir. Nutrients such as nitrogen and phosphorus are especially important influences on phytoplankton growth. Agricultural runoff and sewage inputs are the main sources of these nutrients in the Des Moines River. Diatoms require silica to sustain their populations. Turbidity is probably the most important limiting factor for phytoplankton growth in the Des Moines River since it directly affects light penetration.

3.2.2.6.3 Phytoplankton composition within Red Rock Reservoir is very similar to that of the Des Moines River. During normal and low flows, the standing crop of algae is highest at the inlet due to constant nutrient replenishment and recruitment of new individuals (Johnson 1974). This condition changes during high water as a result of dilution and high turbidity. Short-term water retention, coupled with the high turbidity, limit phytoplankton growth in the reservoir and apparently prevent the occurrence of algal blooms.

3.2.2.7 Zooplankton

3.2.2.7.1 Investigations of the zooplankton of Lake Red Rock (Asch 1971; McGrath 1973) have indicated that Copepoda and Cladocera taxa typically dominate. Neither study indicates the presence of Rotifera. Dominant genera include Copepoda (Cyclops, Diaptomus) and Cladocera (Bosmina, Ceriodaphnia, Daphnia, Diaphanosoma, Moina).

3.2.2.7.2 Although Rotifera were not reported, it is likely that Rotifera are present in Lake Red Rock. Rotifers are typically common, if not dominant, in many Midwestern lakes and reservoirs. It is probable that the screen used for filtering/concentrating of the samples may have resulted in the loss of rotifers, as they are significantly smaller than the Copepods and Cladocerans.

3.2.2.7.3 Investigations have indicated that the zooplankton community exhibits numerous fluctuations and peaks in numbers, with each major peak involving different complexes of taxa. Spatial differences also were detected, with the higher densities occurring in the upper portion of the reservoir and lower densities in the deeper zones in proximity to the dam.

3.2.2.7.4 Retention time was found to be the most significant factor influencing zooplankton abundance. Other factors included water temperature and discharge (which is closely linked to retention time).

3.2.3 THREATENED AND ENDANGERED SPECIES

3.2.3.1 Two species potentially occurring in the project area that are listed as federally endangered under the Endangered Species Act of 1973, as amended, are the Indiana bat (Myotis sodalis) and the bald eagle (Haliaeetus leucocephalus). The Indiana bat is known from Jasper and Marion Counties and typically frequents riparian habitats. Roosting and rearing areas for young are usually under loose bark or in cavities of dead or dying trees. No hibernacula are known from the immediate study area.

3.2.3.2 The bald eagle is a regular wintering species of the study area. It is found in Marion and Polk Counties and is usually seen perched in large trees along the river bank. Feeding usually occurs in ice-free areas, and roosting is typically in heavily forested ravines (U.S. Fish and Wildlife Service 1986).

3.2.3.3 Species historically known from the study area and identified as threatened or endangered by the IDNR are provided in table EIS-4. These species are predominantly upland species or are found some distance from the immediate project area. The river otter, however, was recently reestablished in Lake Red Rock. Fourteen (14) otters were introduced in 1983. Since then, two have died and two specimens dispersed to the lower Des Moines River. The remaining 10 individuals are known to range upstream of the Highway 14 bridge.

3.3 GEOTECHNICAL ELEMENTS

3.3.1 BEDROCK GEOLOGY/STRATIGRAPHY

3.3.1.1 The project area is underlain by Carboniferous rocks which in turn are overlain by unconsolidated Quaternary deposits. Des Moines Series rocks of the Pennsylvanian System dominate the exposures in this area of the Des Moines River Basin. However, outcrops of Meramec Series rocks of the Mississippian System are present a few miles upstream of the dam site. A general geological block diagram is presented in figure EIS-3.

TABLE EIS-4

Threatened or Endangered Species and Communities Located Near Red Rock Reservoir and Along the Des Moines River Downstream of Red Rock Dam

Species Name	Location	Inventory* Rank	Legal† Status	Year Last Seen
Western sand darter	T72N R13W Sec. 31	S2	T	1884
Copperhead	T69N R 9W Sec. 34	S1	E	1942
Indiana bat	T75N R18W Sec. 11	S1	E	1977
	T76N R18W Sec. 18			1980
	T76N R18W Sec. 30			1979
Woodland vole	T72N R14W Sec. 19	S2	T	1914
Pink milkwort	T76N R19W Sec. 5	S1	E	1962
Clustered sedge	T76N R18W Sec. 30	S1	E	1957
Yellow trout lily	T76N R18W Sec. 18	S2	E	1981
	T76N R19W Sec. 15			1978
	T76N R19W Sec. 5			1980
False helebore	T68N R 8W Sec. 15	S2	T	1953

* Inventory ranks are assigned by the Natural Areas Inventory and depend largely on the number of sites from which an element is known:

S1 1-5 sites known in Iowa
S2 6-20 sites known
S3 21-100 sites known
S4 Probably secure in Iowa
S5 Secure in Iowa
SU Number of sites unknown

† Legal status is assigned by the state ecologist and the Legislature and reflects degree of legal protection.

E Endangered
T Threatened
\- No special protection

Source: IDNR, 1986.

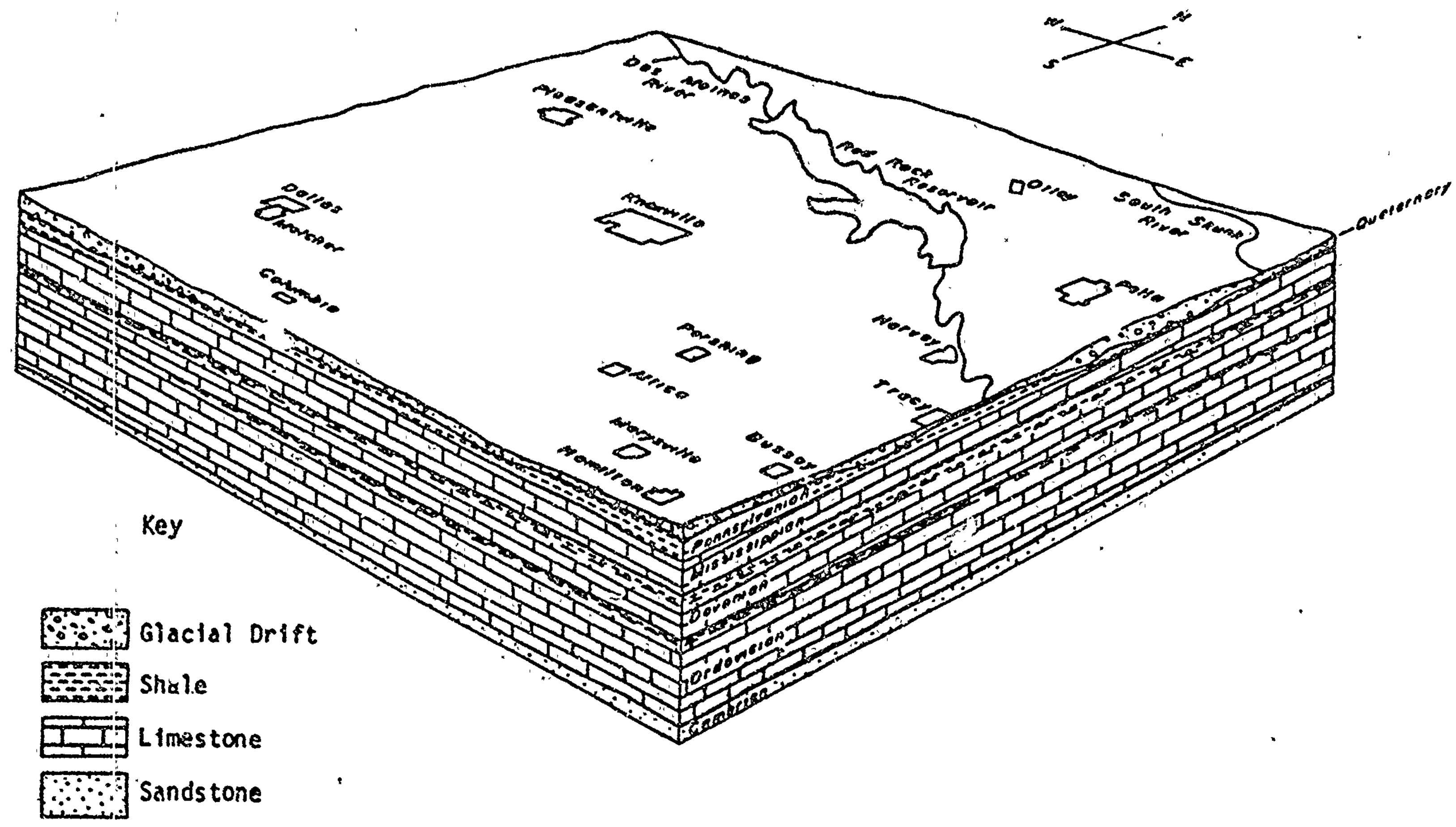


Figure EIS-3
BLOCK DIAGRAM OF MARION COUNTY GEOLOGY

3.3.1.2 The exposed Mississippian System consists of St. Louis Limestone of the Meramec Series (figure EIS-4). The lower part of the St. Louis Formation is commonly sandstone grading into arenaceous dolomite which is locally cherty and contains a high percentage of gypsum and anhydrite. Brecciated zones, where observed in outcrops of carbonate rock, are probably due to dissolution of evaporites and subsequent collapse. The upper part of the St. Louis Formation varies from a locally cherty, micritic limestone to a sandy limestone. Depositional environments for the St. Louis Formation include restricted and marginal marine conditions for the lower portion and normal marine for the upper portion (Avcin and Koch 1980). The St. Louis Formation is unconformably overlain by either Pennsylvanian or Quaternary deposits.

3.3.1.3 Pennsylvanian rocks are represented by the Des Moines Series comprised of the older Cherokee Group and younger Marmaton Group (figure EIS-5). The Cherokee Group has recently been divided into the Kilbourn, Kalo, Floris, and Swede Hollow Formations (Ravn et al., 1984). Dominant lithologies are dark shale and siltstone. Lithologies in decreasing abundance include sandstone, lighter colored shale, coal, limestone, and black phosphatic shale.

3.3.1.4 Between Dunreath and Harvey, Iowa, are exposures of "Red Rock Sandstone" belonging to the Des Moines Series, most probably a unit of the Cherokee Group. This bright red sandstone, exposed in nearly vertical valley walls, rises in excess of 100 feet from the valley floor. The sandstone is underlain by a coal seam averaging 4 feet in thickness which in turn in underlain by approximately 75 feet of shale interbedded with several persistent coal seams.

3.3.1.5 The Marmaton Group has been divided into 11 formations and 19 members. Whereas shale and sandstone are predominate, limestones are persistent and serve as marker units. Several coal units are present and have been named; however, only the Mystic Coal member has significant reserves. The Des Moines Series rocks are indicative of terrestrial to marginal marine conditions initially, which later give way to more open marine influences in conjunction with eustatic sea level fluctuations.

3.3.1.6 Unconsolidated materials consist of Pleistocene age glacial and glacially-derived sediments and Holocene alluvium. The sequence of Pleistocene glaciation in the project area is Nebraskan glacial drift overlain by Kansan glacial till, outwash, and loess, and capped by Wisconsinan loess. The Illinoian glacial advance is not represented in this area. The Pleistocene deposits rest unconformably upon Pennsylvanian rocks. The Kansan glacial till marks the onset of the Ottumwa Epoch, consisting of the Kansan glacial stage and the Yarmouth interglacial stage. The Kansan till was deposited as a massive drift averaging 50 feet in thickness and rests on the Nebraskan till. The tills are generally found in the uplands and are typically capped by Kansan and/or Wisconsinan loess deposits.

3.3.1.7 The Holocene was a period of weathering, erosion, and extensive reworking and redeposition of the Pleistocene deposits. The alluvium derived from glacial material is present along the Des Moines River, its

		CENTRAL	SOUTHEAST
Meramec		Ste. Genevieve	Ste. Genevieve
Meramec		St. Louis	St. Louis Spergen
Osage		Warsav	Warsaw
Osage		Keokuk	Keokuk
Osage		Burlington	Burlington Formation Cedar Fork Member Haight Creek Member Dolbee Creek Member
Kinderhook		Gilmore City Hampton Formation Iowa Falls Member Eagle City Member Maynes Creek Member	Hampton Formation Wassonville Member
Kinderhook	North Hill Group	Chapin Prospect Hill McCraney	Starrs Cave Prospect Hill McCraney

Figure EIS-4
MISSISSIPPIAN SRATIGRAPHIC COLUMN FOR IOWA

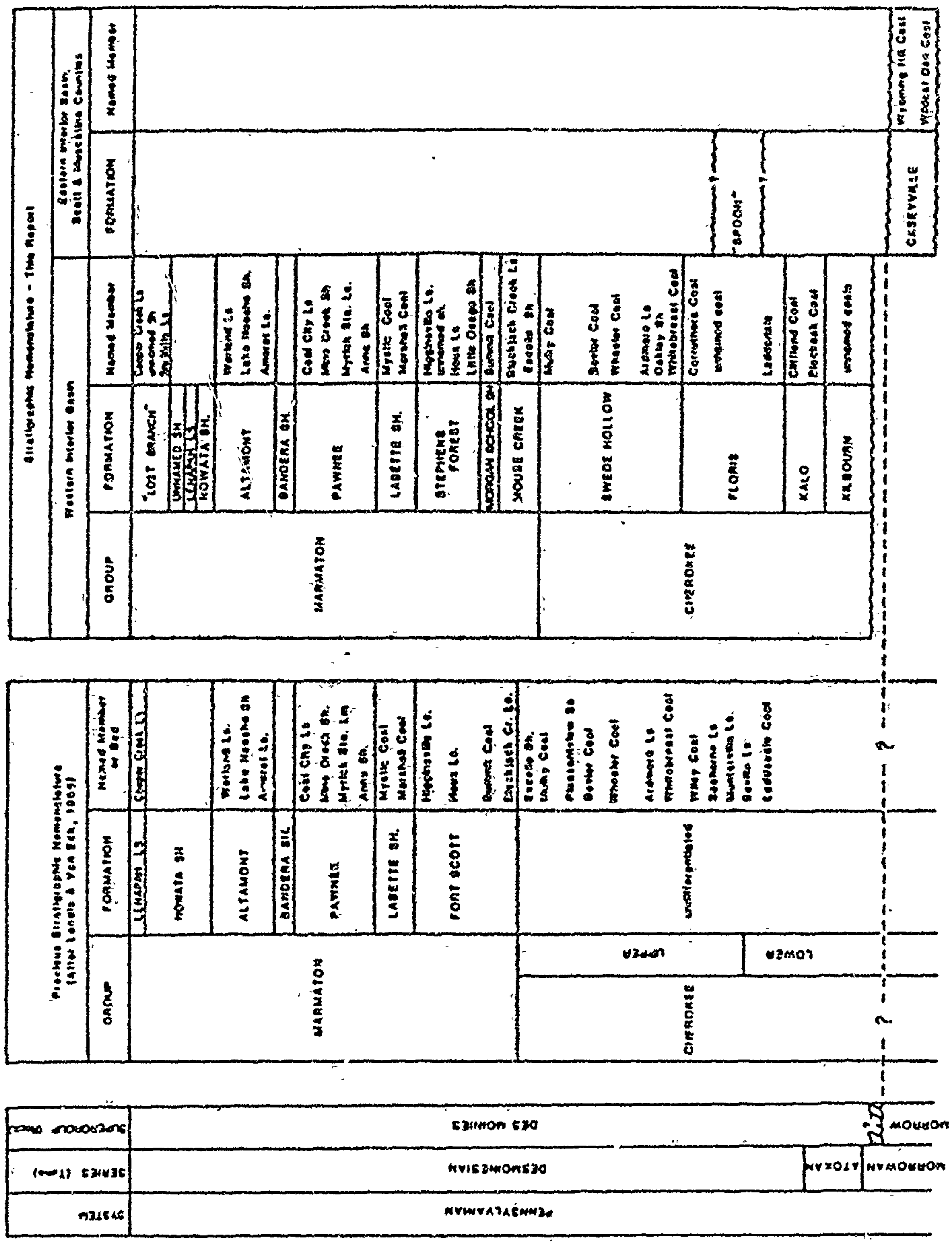


Figure EIS-5
PENNSYLVANIAN STRATIGRAPHIC COLUMN FOR IOWA

tributaries, and other smaller streams; these alluvial zones range in width from an eighth of a mile to 2 miles. They comprise the first bottomlands between the streams and are subject to periodic overflow. Generally, the second bottom consists of alluvial soils and marks historic levels of the river's floodplain.

3.3.2 GEOMORPHOLOGY/TOPOGRAPHY/DRAINAGE

3.3.2.1 The broad Des Moines River Valley in the vicinity of the reservoir is indicative of a mature drainage system. The flat floodplain is bordered by gentle slopes rising to till and loess-covered uplands. Locally, the valley walls are steep and rugged; however, the topography is predominantly rolling.

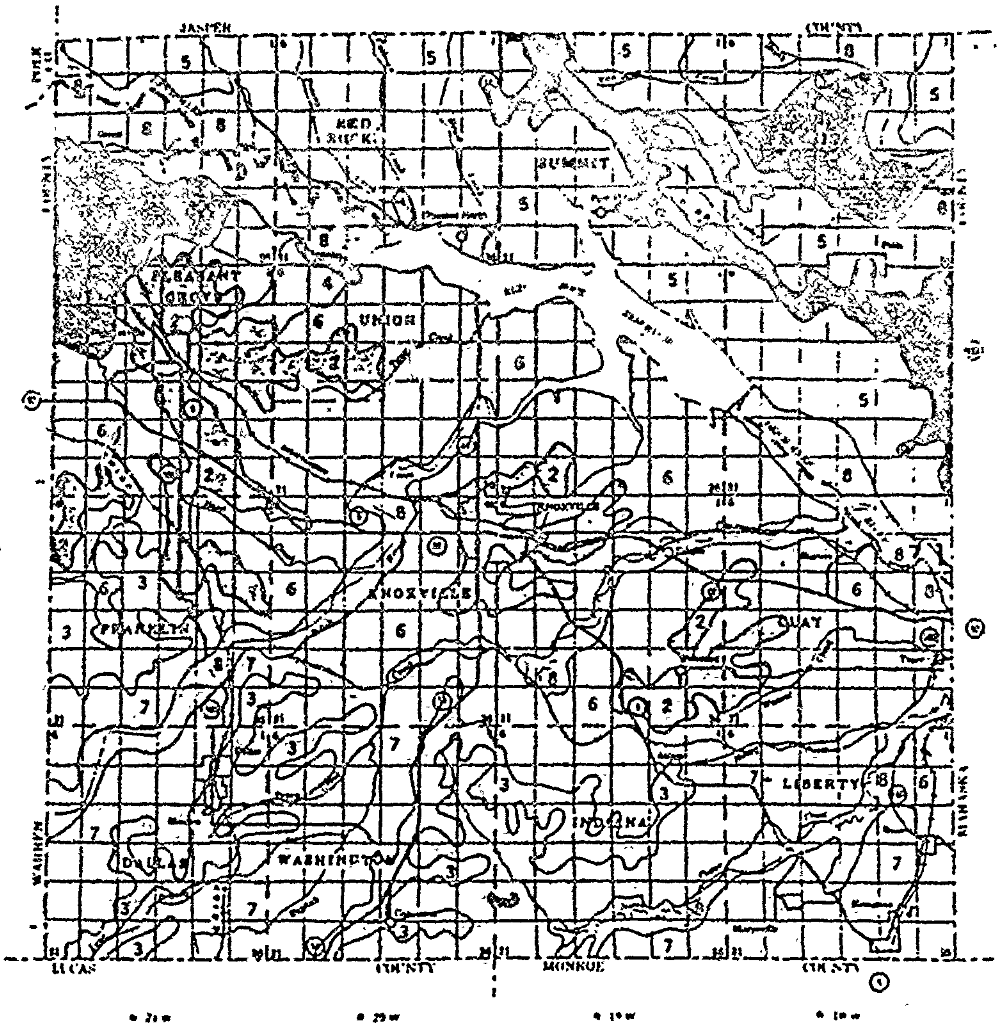
3.3.2.2 In the project area, the river flows through Pennsylvanian coal measures interbedded with low resistance shales capped by glacial drift and loess. These materials promote formation of the presently wide floodplain. However, a change in lithology approximately 1 mile north of Red Rock, Iowa, results in a narrower, steeper valley. There, steep exposures of Red Rock sandstone occur which are significantly more resistant than the coal measures and shale upstream. Downstream of Red Rock, the bluffs grade into more gentle slopes as the river passes from sandstone back into shale. However, the valley remains narrow due to further downcutting into resistant arenaceous strata of the St. Louis Formation.

3.3.3 SOILS

3.3.3.1 In the vicinity of the reservoir, three major soil associations have been defined based primarily on physical properties of the soils and their locations. There groups are: (1) the Nodaway-Zook-Ackmore association; (2) Ladoga-Clinton-Otley association; and (3) Ladoga-Sharpsburg-Clinton association (figure EIS-6). Further upstream and encompassing the maximum conservation pool are two major groups: (1) the Fayette-Downs association, and (2) the Tama-Muscatine association (SCS, 1980 and 1953).

3.3.3.2 The Nodaway-Zook-Ackmore association occurs on nearly level to gentle slopes and have poorly to moderately well-drained soils that formed in alluvium on floodplains of major streams. Nodaway soils are well-drained dark silty loams and occur near original and present stream channels. Zook soils are mainly silty, clay loams. They are typically dark poorly-drained soils and are found on floodplains. Ackmore soils also occur on floodplains. These soils are somewhat poorly drained and are usually dark silty loams to silty clay loams. Subsoils in this group include Nevin, Bremer, Spillville, Colo, Wabash, Landes, riverwash, and alluvial lands.

3.3.3.3 The Ladoga-Clinton-Otley association is found on the north side of the reservoir on gently to strongly sloping hills and has moderately well-drained soils formed in loess on uplands. Ladoga soils are well-drained dark silt loams to silty clay loams in the subsoil and occur on convex ridge tops and side slopes having formed under mixed prairie grass and trees. Clinton soils are similar but have a different p[illegible]le which



1. Taintor - Mahaska Association
2. Sharpsburg - Macksburg - Winterset Association
3. Arispe - Grundy - Haig Association
4. Fayette - Downs Association
5. Ladoga - Clinton - Otley Association
6. Ladoga - Sharpsburg - Clinton Association
7. Gosport - Pershing - Gara Association
8. Nodaway - Zook - Ackmore Association

SOURCE: MODIFIED FROM SOIL SURVEY OF MARION COUNTY, IOWA, 1980

Figure EIS-6
GENERAL SOIL MAP OF MARION COUNTY, IOWA
(YAMA - MUSCATINE ASSOCIATION NOT SHOWN)

formed under forests. Otley soils are very dark silty clay loams formed under native prairie and are moderately well drained. These soils tend to have a moderate to high organic content in the surface layer and their available water capacity is high. Minor soils in this group include Lindley, Gara, Colo, and Elg. The first two tend to form on steep slopes in glacial till, the last two form colluvium and alluvium in drainageways.

3.3.3.4 The Ladoga-Sharpsburg-Clinton association is found to the south of the reservoir on gently to strongly sloping hills and have moderately well-drained soils that formed in loess on uplands. The Ladoga and Clinton soils were described in the previous paragraph. The Sharpsburg soils are very dark to dark silty clay loams formed under native prairie. Minor soils include the Gosport, Lindley, Chelsea, and Olmitz soils. The surface layer in this group of soils has moderate to high organic content and high available water capacity.

3.3.3.5 Slightly further from the reservoir or of lesser areal extent are the Taintor-Mahaska association and the Fayette-Downs association. The former occurs on nearly level uplands and consists of poorly-drained silty clay loams formed in loess. The latter association occurs on gently sloping to steep hillsides. The soils are typically well-drained silty clay loams formed in loess or uplands.

3.3.4 MINERAL RESOURCES

3.3.4.1 The immediate project area and adjacent counties are known to have reserves of bituminous coal, limestone, sand, gravel, and gypsum. The coal located near Lake Red Rock contains a relatively high sulfur component that exceeds State air pollution standards when burned. Strip-mining methods employed previously resulted in undesirable scars upon the landscape. Advances in mining methods, reclamation, and sulfur extraction along with improved burning and cleaning technology could make the coal economic as well as in compliance with environmental standards. At present, water quality studies at stations in the study area do not indicate any streams having exceeded established criteria for identification of acid-mine drainage (Detroy et al., 1983).

3.3.4.2 Limestone, sand, gravel, and gypsum deposits are present and are needed in the construction industry. A gypsum mine at Harvey is active, producing from a depth of about 200 feet in Mississippian strata.

3.3.4.3 Fertilizer and aggregate quality limestone occur in the Lake Red Rock area. Sand and gravel has been exploited commercially, extracted from deposits along the Des Moines River upstream and downstream of Lake Red Rock.

3.4 HYDROLOGY/WATER QUALITY

3.4.1 SURFACE WATER RESOURCES

3.4.1.1 Lake Red Rock conservation and flood control pool is fed by the Des Moines River and five primary tributaries. The total drainage area above Red Rock Dam is 12,323 square miles. At 728 feet NGVD, the water

surface covers approximately 6,875 acres within Marion County. At the maximum flood pool elevation of 780 feet NGVD, the lake extends over 65,500 acres and includes parts of Warren, Polk, and Jasper Counties.

3.4.2 MAJOR TRIBUTARIES

3.4.2.1 Five sub-basins corresponding to the major tributaries in the Des Moines River/Lake Red Rock area can be identified. These tributaries are the Raccoon, North, Middle and South Rivers, and Whitebreast Creek (Figure EIS-7). Several smaller streams in the area contribute to these rivers. Information regarding these tributaries in 1984 (which included a record flood event) is described below.

3.4.2.2 At Van Meter (15 miles west of Des Moines) the main stem Raccoon River is joined by the North, Middle, and South Raccoon Rivers. The average flow of 4,000 ft^3/s (1984) is derived from a 3,441-square-mile drainage area. The average discharge over a 69-year period of record is 1,384 ft^3/s (Iowa Geological Survey, 1973-1984).

3.4.2.3 The North River had a mean discharge of 481 ft^3/s in 1984 with a mean discharge of 189 ft^3/s over 44 years. It enters the Des Moines River just south of the confluence of the Des Moines and Raccoon Rivers. The drainage area of the North River (at Norwalk) is approximately 349 square miles.

3.4.2.4 The Middle River lies south of the North River and has a drainage area of approximately 503 square miles. At Indianola, the mean discharge was 549 ft^3/s (1984) with an average discharge over 14 years of 263 ft^3/s.

3.4.2.5 The South River near Ackworth has a total drainage area of 460 square miles. Mean discharge in 1984 was 431 ft^3/s and the average over 44 years of record is 349 ft^3/s.

3.4.2.6 Whitebreast Creek joins the Des Moines River just north of Knoxville and flows directly into Lake Red Rock approximately 4 miles upstream of the dam. The drainage area of this river system is 342 square miles (to the town of Dallas). Whitebreast Creek had a mean discharge of 352 ft^3/s (1984) and an average discharge in a 22-year period of 208 ft^3/s.

3.4.3 FLOW CHARACTERISTICS

3.4.3.1 Table EIS-5 shows data for all streams identified in the previous section. The data show the relative size of the Des Moines River to its tributaries, particularly the significant contribution of the Raccoon River.

3.4.4 SURFACE WATER QUALITY

3.4.4.1 Recent water quality data for Lake Red Rock indicate that water quality characteristics are generally typical of reservoirs having predominately agricultural watersheds. Key parameters are summarized in appendix C, tables C-1 through C-9. There have been relatively few water quality associated problems at Lake Red Rock or downstream in the Des Moines River.

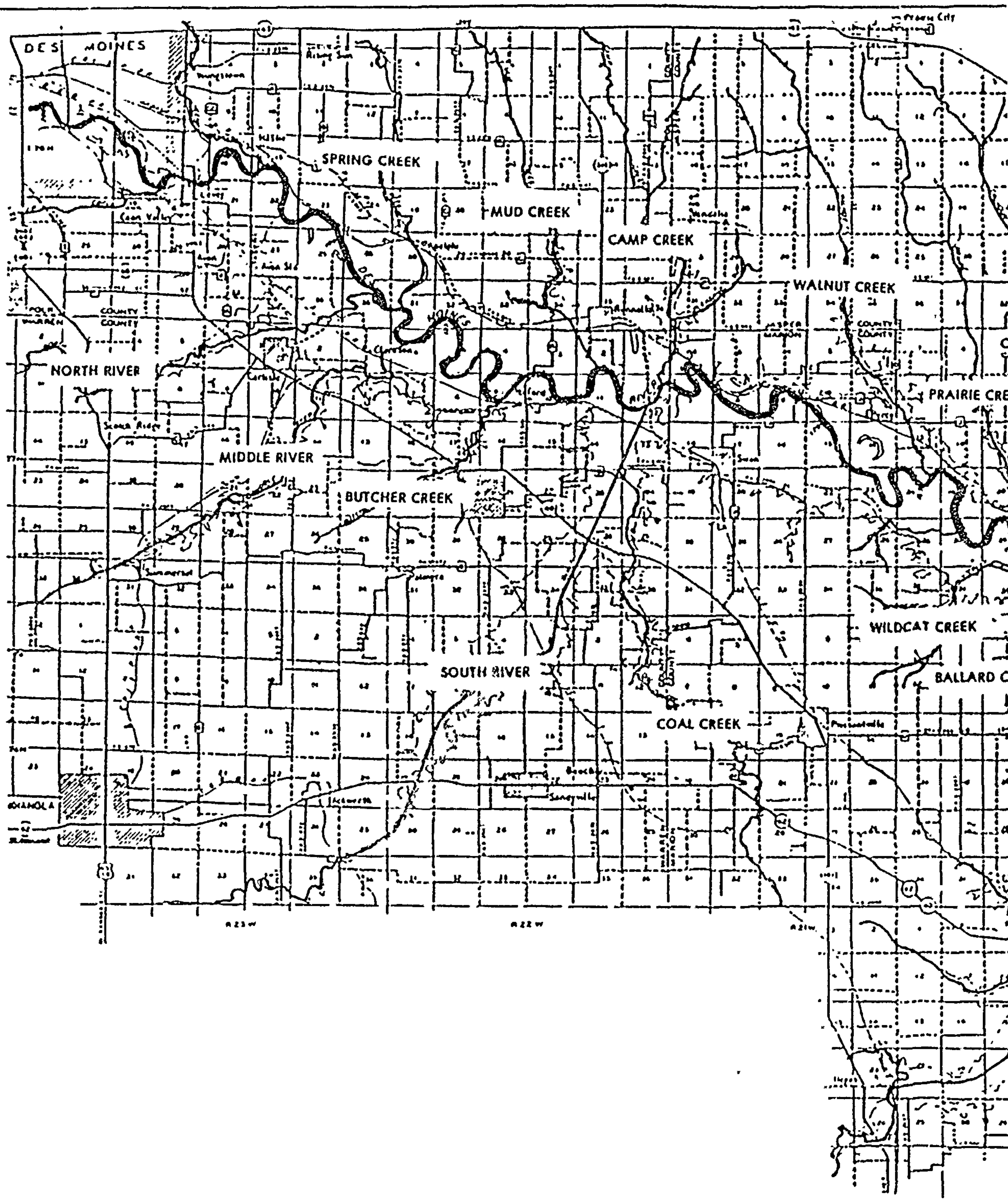
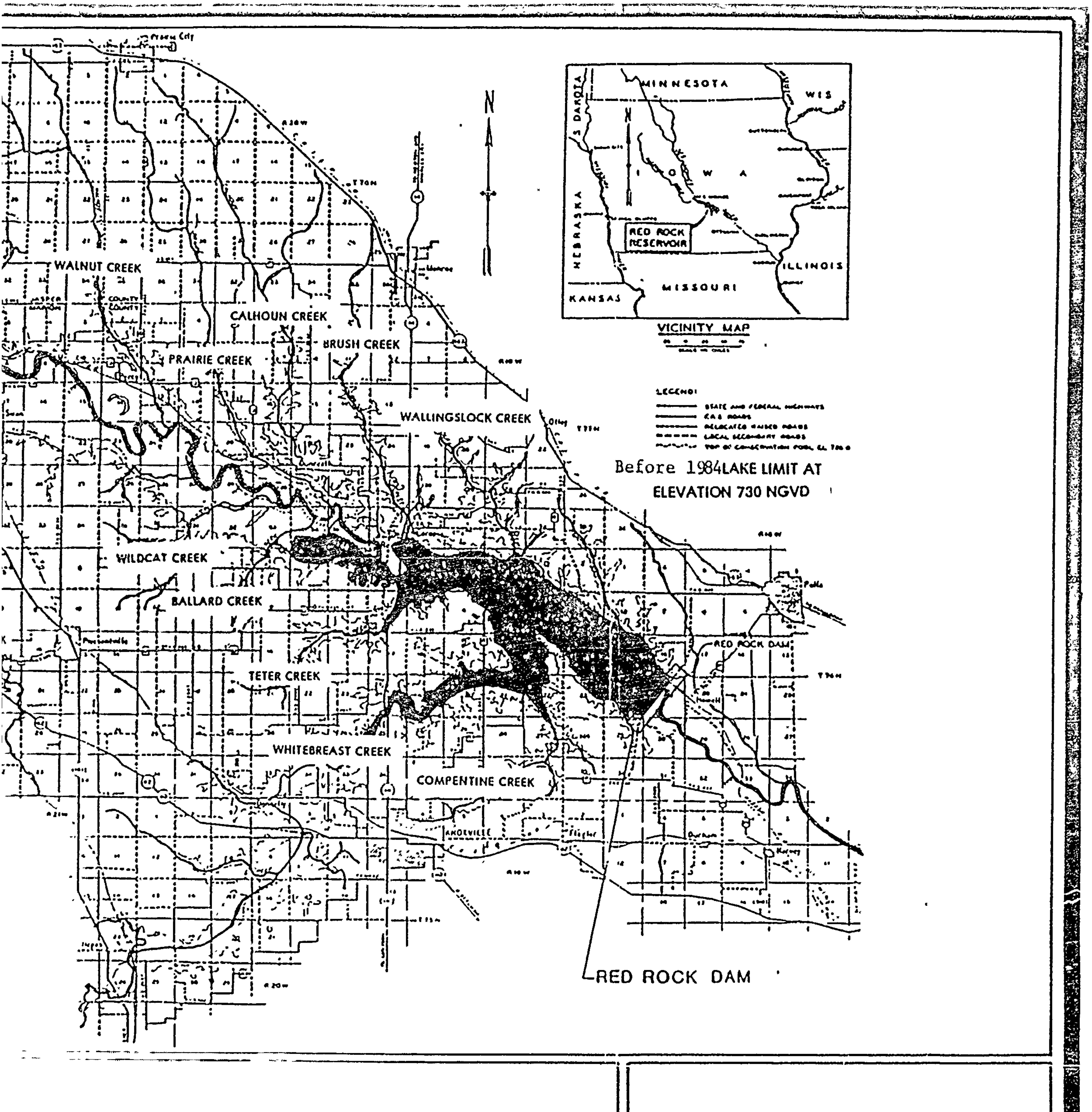


Figure EIS-7
MAJOR AND MINOR TRIBUTARIES TO THE DES MOINES RIVER IN THE STUDY AREA



MINNESOTA
WIS
S DAKOTA
IOWA
NEBRASKA
RED ROCK RESERVOIR
ILLINOIS
MISSOURI
KANSAS
VICINITY MAP
LEGEND
WALNUT CREEK
CALHOUN CREEK
BRUSH CREEK
PRAIRIE CREEK
WALLINGSLOCK CREEK
Before 1984 LAKE LIMIT AT ELEVATION 730 NGVD
WILDCAT CREEK
BALLARD CREEK
RED ROCK DAM
TETER CREEK
WHITEBREAST CREEK
COMPENTINE CREEK
KNOXVILLE
RED ROCK DAM

TABLE EIS-5

Flow Characteristics from Selected Gaging Stations

Location of Gaging Station	Mean*	Flow Rates (ft^3/s) Minimum†	Maximum†
Raccoon River at Van Meter	1384	10.0 (1/22-31/40)	41,200 (6/13/47)
North River at Norwalk	189	0.0 (**)	32,000 (6/13/47)
Middle River at Indianola	263	0.11 (7/2/77)	34,000 (6/13/47)
South River at Ackworth	249	0.0 (9/19-10/13/56)	34,000 (6/5/47)
Whitebreast Creek at Dallas	208	0.07 (9/29/68)	37,300 (7/16/82)
Des Moines River at Saylorville	2900	13.0 (1/25/77)	47,400 (4/10/65)
Des Moines River below Raccoon River	4456	26.0 (1/16-29/77)	77,000 (6/27/47)

* Mean discharge for period of record.

† Dates of recorded minimum/maximum are given in parentheses.

** No flow at various times between 1954 to 1958.

Source: Iowa Geological Survey, 1973-1984.

NOTE: Examination of a longer period, or other period of record would probably result in different minimum and maximum flow rates.

3.4.4.2 A frequent water quality problem has been the high levels of fecal coliform bacteria that often develop in the spring and summer. High coliform levels indicate the potential presence of organic wastes which would limit usage for body-contact recreation and consumption.

3.4.4.3 Potentially toxic substances which have been present at detectable levels in Lake Red Rock include pesticides (e.g., alachlor, atrazine, dieldrin, cynazine, 2,4-D) and heavy metals (lead, mercury, arsenic, cadmium, chromium). These have generally been present at concentrations well below State standards and/or EPA criteria. However, mercury has periodically been found at slightly higher than acceptable concentrations in the discharge from Lake Red Rock, notably in 1984-1985. In most cases, the pesticide and metals concentrations do not represent a threat to aquatic organisms.

3.4.4.4 There have been frequent violations of standards and/or criteria for un-ionized ammonia and dissolved oxygen. Un-ionized ammonia is quite toxic to fish and other aquatic organisms. It is present at elevated levels (especially during the summer months) because of the high nitrogen-loading into the reservoir from upstream agricultural lands and the increase in the un-ionized ammonia fraction with increasing water temperature and pH.

3.4.4.5 Dissolved oxygen concentrations below 4.0 mg/l are typically considered inadequate to support warm-water aquatic organisms. Such oxygen depletions have been common in Lake Red Rock only during periods of summer stratification (a phenomenon typical in Midwestern reservoirs), during which the deeper zones of the lake do approach anoxia. With this exception, dissolved oxygen concentrations within the pool and in the tailwaters below Lake Red Rock are generally adequate to support aquatic communities. There have been isolated periods where surface waters exhibited reduced dissolved oxygen levels. These have generally been localized and of short duration and were likely associated with periods of high surface runoff and organic loading and/or unusual climatic/meteorologic conditions.

3.4.5 GROUND WATER RESOURCES

3.4.5.1 The alluvial and Cambrian-Ordovician aquifer are the two most productive water sources in the project area, in terms of both quantity and quality. The surficial aquifers are the most easily accessed, recharged, and drained. Bedrock aquifers are charged by both lateral and vertical movement at a rate slower than that of the alluvial aquifer.

3.4.5.2 Water quality characteristics for alluvial, drift, and buried-channel aquifers are depicted in table EIS-6. Table EIS-7 shows the chemical characteristics of the principal bedrock aquifers. The upper bedrock aquifers, including the Pennsylvanian, Mississippian, and Silurian-Devonian aquifers are generally of poor quality and unsuitable for drinking purposes. In contrast, the Cambrian-Ordovician aquifer, in particular the Jordan Sandstone, produces good quality water.

TABLE EIS-6

Chemical Analyses from the Surficial Aquifers Showing the Range and Average of Selected Chemical Constituents*

	Dissolved Soils	Hardness (as $CaCO_3$)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Sodium (Na)	Iron (Fe)	Manganese (Mn)	Number of Analyses
					Alluvial aquifer					
A	417	288	105	13	0.3	4.2	20.2	9.4	1.5	56
R	165-1000	124-762	3-350	0.5-180	0.1-0.45	0.1-17	4.1-85	0.04-51	0.05-17	
					Shallow drift aquifer					
A	736	480	177	37	0.3	81	68	1.1	0.13	95
R**	220-2840	153-1710	12-1470	0.5-200	0.2-0.8	0.1-570	7.3-710	0.02-30	0.05-1.9	
					Intermediate drift aquifer					
A	1030	569	397	9	0.5	6	108	5	0.09	23
R	261-2726	150-1518	7-1520	0.5-49	0.2-1.0	0-44	17-368	0.04-24	0.05-0.37	
					Deep drift and buried-channel aquifers					
A	2346	868	1254	30	0.6	6.7	334	3.4	0.24	15
R	383-3657	140-1640	42-1990	3-110	0.1-2.0	0-82	54-568	0-18	0-1.4	

* Results in milligrams per liter. Analysis by State Hygienic Laboratory of Iowa.
Average
** Range

TABLE EIS-7

Chemical Analyses from the Bedrock Aquifers Showing the Range and Average of Selected Chemical Constituents*

	Dissolved Soils	Hardness (as $CaCO_3$)	Sulfate (SO_4)	Chloride (Cl)	Flouride (F)	Nitrate (NO_3)	Sodium (Na)	Iron (Fe)	Manganese (Mn)	Number of anal.
				Pennsylvanian (Cherokee Group) aquifers						
A†	4531	869	1088	97	1.4	3.5	536	3.2	0.15	85
R**	251-7092	44-1559	22-4139	0.5-780	0.2-4.0	0-50	7-2180	0.1-22	0-4	
				Mississippian aquifers						
				Upper part of Mississippian aquifer in Marion County where aquifer is bedrock surface						
A	674	449	217	48	0.24	††	43	2.2	0.12	9
R	422-1380	108-952	27-563	2-32	0.2-0.4	0.1-4.3	8.3-240	0.2-9.8	0.05-0.25	
				Upper part of Mississippian aquifer in Marion County where overlain by Pennsylvanian rocks						
A	2826	862	1493	109	1.3	1.6	492	6.6	0.06	18
R	368-6500	124-1660	49-3480	1-492	0-2.4	0.1-7.1	6.8-1480	0.1-45	0.01-12	
				Lower part of Mississippian aquifer in Marion County where overlain by upper part aquifer						
A	3320	1004	1856	89	0.93	15.4	626	4.1	0.23	8
R	1189-4990	731-1159	582-3065	9-230	0-2.8	0.04-32	28-1091	0.18-25	0-1.3	
				Mississippian aquifer in area outside Marion County						
A	4274	923	2385	176	1.9	8.4	965	7.6	0.11	29
R	1210-8400	60-1580	19-750	1.0-3.6	1.0-3.6	0-150	270-2100	0.05-23	0-0.34	
				Cambrian-Ordovician aquifer						
A	1098	370	397	150	2.3	1.2	226	2.4	0.05	22
R	615-2560	246-1100	190-930	29-620	1.2-3.2	0.08-5.5	100-520	0.04-10	0.01-0.10	

* Results in milligrams per liter. Analysis by State Hygienic Laboratory of Iowa.
†† Only three samples
† Average
** ıge

3.4.6 UNDERSEEPAGE

3.4.6.1 The Rock Island District, U.S. Army Corps of Engineers, conducted an investigation of underseepage at Red Rock Dam from 1980 to 1984 (U.S. Army Corps of Engineers 1984). The field and laboratory study examined the following features: surface seepage points, temperature changes and gradients, piezometric changes, conductivity, aerial photography, and geochemical analysis. The study concentrated on the grout gallery and left (north side) abutment, and analyzed the data to determine seepage paths and assess changes in the underseepage or foundation conditions.

3.4.6.2 The study concluded that underseepage in the left (north side) valley and abutment is directly related to the reservoir head and defined two primary paths. The study recommended implementation of a new subsurface exploration program to assess these primary paths. In addition, new ground water monitoring instrumentation to assure regular and adequate testing of representative samples was advised. This would facilitate frequent sampling, monitoring, and evaluation of site conditions to ensure dam safety.

3.5 LAND USE

3.5.1 ANALYSIS AND ASSESSMENT OF EXISTING CONDITIONS

3.5.1.1 The project area is comprised of 47,610 acres of fee title area; 2,600 acres of the Des Moines River bed; and 28,382 acres of flowage easements. Land uses within the project area have remained essentially unchanged since the initial construction stages. Uses include flood control, recreation, and fish and wildlife purposes as set forth in the Master Plan for Resource Management (see Resource Master Plan plates 6 through 12 for land use and management within the fee title area). Initially, the criterion for fee title land acquisition was the 5-year flood frequency elevation of 760 feet NGVD. The upper guide for holding land in flowage easement was 783 feet NGVD.

3.5.1.2 Fee Title Lands. Land-use allocations are established within the fee title area which designates a priority of use. The land use allocations include Recreation (intensive use and low-density use), Wildlife Management, Reserve Forest Land, and Project Operations.

3.5.1.2.1 Recreation Land--Intensive recreation areas include facilities for camping, picnicking, swimming, and other intensive recreation activities. Recreation lands within the study area are managed jointly by the Corps of Engineers, IDNR, and Marion County. The Corps of Engineers' intensive recreation areas are located on the main lake area, below Roberts Creek and Whitebreast Creek, and in the tailwaters area; the IDNR leases 2,094 acres in North and South Elk Rock located below Highway 14 on the ~~north and south sides of the lake; and Marion County manages about 1,625~~ acres of leased land with 1,413 acres for intensive recreation at Roberts Creek and the remaining acreages in trail systems, roadway easements, and boat ramps. In addition, the Corps of Engineers manages low-density recreation areas allocated for activities such as nature study and to serve as buffer zones between incompatible use areas.

3.5.1.2.2 Wildlife Management Land--Wildlife management lands encompass the major land use within the fee title lands. These lands are managed for wildlife food and cover programs, enhancement of habitat, and low-density recreation (fishing and hunting); the managing agencies include the IDNR, Corps of Engineers, and private individuals. There are five main management practices including: (1) planting of tree and shrub species valuable to wildlife on developed recreation areas; (2) enhancement of plant succession from annual weeds to perennial grassland associations; (3) interspersion of limited agricultural strips and lands left to natural successions; (4) interspersion of limited agricultural strips, natural succession areas, and shrub rows; and (5) interspersion of shrub rows and agricultural food plots. The IDNR outgrants a 25,572-acre area for fish and wildlife management which extends from the upper reaches of the fee title area to the Highway 14 bridge, principally within the elevations of 728 to 760 feet NGVD. Seasonal changes of the conservation pool to 730 feet NGVD provide a higher pool level for the waterfowl and wildlife program. The IDNR is responsible for all fish management and maintains a fishery in Lake Red Rock. The management practices strive to enhance fish and waterfowl habitat while preserving upland sites for upland game management. There are approximately 10,350 acres in agricultural plots for wildlife habitat. Management includes administering and enforcing regulations of private and commercial fishing and hunting. There are about 23,422 acres permitted for hunting and 2,150 acres for refuge. The Corps of Engineers manages the wildlife lands in the upper reaches of Teter Creek primarily within the elevations of 728 to 760 feet NGVD. Lands leased by private individuals for the purpose of agricultural production within the wildlife management areas consist of approximately 2,113 acres.

3.5.1.2.3 Forest Management Land-- The objectives of the Corps of Engineers forestry management program are to preserve, improve, and maintain vegetative cover for soil stabilization; improve watersheds and aesthetics; manage low-density activities; and preserve and improve the wildlife habitat. Reserve forest areas are located between the Whitebreast recreation area and South Overlook area, in the Competine Creek area, in the Whitebreast Creek area, the upper reaches of Wildcat Creek, and the Wallashuck area. These lands include approximately 2,032 acres.

3.5.1.2.4 Project Operations Land--Project operations land is allocated to provide for the safe and efficient operation of the project for purposes other than recreation or fish and wildlife. These include operational structures, buildings, maintenance facilities, satellite offices, and storage yards. Project operations include the dam, the operations area south of the dam, and the outlet channel at Roberts Creek, which encompasses approximately 271 acres.

3.5.1.3 Flowage Easement Land. Flowage easement land includes areas which have perpetual flowage easements to the elevation of 783 feet NGVD, 3 feet above the flood control pool. There are an estimated 1,385 tracts covering a total of 28,382 acres in this area. The easements provide a perpetual right to permanently overflow below elevation 760 feet NGVD and a perpetual right to occasionally overflow above 760 feet NGVD. The

landowners retain fee simple title to the land and all rights to use without interfering with the flowage easement. No structures for human habitation are permitted except for fences. Any other proposed structures must be approved. Habitat on flowage easement land is illustrated in table EIS-8 including agricultural, deciduous forest, oldfield, grasslands or forbs, and man-developed areas.

3.5.1.4 <u>Transportation</u>

3.5.1.4.1 The principal State highway system perimetering and transversing the project area includes Highways 46 and 5 leading from Des Moines, with Highway 5 extending through Knoxville to the south. Highway 163 perimeters the north area from Des Moines through Pella. Highways 316 and 14 transverse north-south, crossing Red Rock Reservoir.

3.5.1.4.2 Marion County provides the principal road access system to the fee title area, with Warren, Jasper, and Polk Counties helping to provide access to the outlying and flowage easement areas. The county's system includes some low-lying unimproved roads within the project area which are currently subject to periodic inundations during flood pools.

3.5.1.5 <u>Downstream Land Use</u>

3.5.1.5.1 Land use within a 500-foot strip on each side of the Des Moines River downstream from Red Rock to the confluence with the Mississippi River consists primarily of vacant forested areas and farmland. The river bank is typically wooded from a 20- to 100-foot depth with farmland immediately adjacent.

3.5.1.5.2 The city of Ottumwa is located on the banks of the Des Moines River in Wapello County. The city of Keokuk is located just north of the mouth of the river. Several smaller towns are located adjacent to the river between Red Rock and the Mississippi River, including Eddyville, Elson, Douds, Leando, Pittsburg, Keosauqua, Bentonsport, Bonaparte, Farmington, and Croton.

3.5.1.5.3 Under normal flood control operations, the reservoir's discharge is regulated to provide a maximum release of 18,000 ft^3/s during crop seasons and a maximum release of 30,000 ft^3/s during non-crop seasons as flood control pool levels permit.

3.6 <u>RECREATION ELEMENTS</u>

3.6.1 ANALYSIS AND ASSESSMENT OF FACILITIES

3.6.1.1 Recreation areas in the reservoir area have been developed under joint coordination of management by the Corps of Engineers, State of Iowa, and Marion County. The major recreation activities include boating, fishing, camping, picnicking, sightseeing, waterskiing, swimming, and hunting. The following is a summary of the major recreation area activities by management agency.

TABLE EIS-8

Flowage Easement Habitat

	Agricultural	Deciduous Forest	Old-Field	Grasslands	Developed	Total
Whitebreast Creek	819	347	27	---	---	1,193
Middle River	659	248	30	---	1	938
South River	2,244	478	224	---	---	2,946
Other Watersheds	12,647	2,676	3,584	1,171	168	20,246
Totals	16,369	3,750	3,865	1,171	169	25,323
Percent of Total	65%	14.7%	15%	4.6%	0.7%	

Source: ESE, 1986.

3.6.1.2 Corps of Engineers

3.6.1.2.1 Fifield--This major day-use area consists of 120 acres located on the north side of Lake Red Rock, approximately 9 miles west of Pella. Existing facilities are oriented toward reserved group picnicking and day-use activity.

3.6.1.2.2 Wallashuck East--This major fee-campground area consists of 160 acres located on the north side of the lake, approximately 6 miles west of Pella. The area is used for camping and lake access. Facilities include a boat ramp, playground equipment, camp pads, showers, a trailer dump station, and nature trails.

The Wallashuck campground boat ramp is a two-lane ramp. The boat ramp is in good condition and serviceable at elevation 736 feet NGVD.

3.6.1.2.3 North Overlook--The North Overlook day-use area is located directly northeast of the dam on both sides of County Road T15, and consists of 422 acres. Activities at North Overlook include camping, swimming, picnicking, and hiking.

3.6.1.2.4 North Tailwater--The North Tailwater day-use area consists of 14 acres located directly below the dam on the northeast side of the tailwater. Access is by County Roads T15 and P. North Tailwater is a popular day-use area for picnicking and fishing with developed drives and designated parking, water supply, fish cleaning station, playground equipment, and modern restroom facilities.

3.6.1.2.5 Howell Station--Howell Station contains 254 acres adjacent to the east bank of the Des Moines River, below the dam. Howell Station is a major fee camping area. Other uses include picnicking, fishing, hiking, and boat access to the river. Access is provided by County Road P.

3.6.1.2.6 Ivan's-- This camping area is adjacent to the west bank of the Des Moines River, below the dam. It consists of 5 acres, with access from County Road P.

3.6.1.2.7 South Tailwater--The South Tailwater day-use area consists of 192 acres located adjacent to the dam. The South Tailwater area is a popular facility for picnicking and fishing.

3.6.1.2.8 South Overlook--The South Overlook day-use area includes 84 acres located on the southern shoreline, directly above the dam and immediately adjacent to County Road T15 approximately 6 miles south of Pella. The area is used for both individual and group picnicking and boat access, and provides a visitor overlook and Visitor Information Center. The boat ramp is serviceable to elevation 760 feet NGVD.

3.6.1.2.9 Whitebreast--The Whitebreast Recreation Area consists of 659 acres located on the south side of the lake. This site is located approximately 10 miles north of Knoxville with access on County Road S71. The area is used for group and general camping, swimming, picnicking, and boat access.

3.6.1.2.10 Other Facilities--Lakevie boat ramp is subject to constant erosion under high lake levels and is inundated at elevation 734 feet NGVD. Coal Ridge boat ramp is usable to elevation 739 feet NGVD. Whitebreast Heights boat ramp is considered unserviceable due to siltation and has been abandoned. The Whitebreast Bay boat ramp (leased to Marion County) is currently usable only to elevation 736 feet NGVD by shallow draft fishing and duck boats. Very little, if any, maintenance is performed each year. Whitebreast Beach is in poor condition due to constant wave erosion and shifting sands. The beach has slowly shifted from the west side to the south side of the peninsula. At elevation 734 feet NGVD, there is a question whether the beach would be usable. The access road is unsurfaced and in poor condition. Both sides of the access road and the west side of the parking area have eroded and are in need of protection.

3.6.1.2.11 It is currently proposed to abandon the existing beach and relocate swimming facilities to another natural sand beach about one-half mile directly south of the peninsula. In addition, it is proposed to abandon Whitebreast Heights boat ramp and construct a new boat ramp just south of the peninsula. Incidental actions to these projects include roadway and parking lot construction, beachhouse construction, and excavation of an access channel through the existing Whitebreast Beach peninsula. Environmental effects of this action are negligible due to the fact that relocation will take place within an existing recreation area. Some removal of sapling trees from an adjacent nursery area may occur.

3.6.1.3 State of Iowa--Elk Rock (North and South). The Elk Rock area, leased and managed by the IDNR, encompasses 2,097 acres, located on both the north and south sides of Lake Red Rock. North Elk Rock is accessible from County Road G28, approximately 10 miles west of Pella. Access to South Elk Rock is by State Highway 14, approximately 7 miles north of Knoxville. South Elk Rock activities include picnicking, boat access, camping, and equestrian trail riding.

The State currently manages three boat ramps: North Elk Rock, South Elk Rock, and the Water Patrol Residence. The South Elk Rock three-lane ramp is unserviceable at normal conservation pool due to siltation; it is serviceable at pool elevations of 742 feet NGVD and higher. The Water Patrol Residence ramp has questionable service at 728 feet NGVD due to shallow waters, but can be serviceable at elevation 742 feet NGVD. The North Elk Rock ramp has questionable service at 728 feet NGVD, due to shallow waters, but can be serviceable to elevation 736 feet NGVD and has heavy erosion on both sides of the ramp. This ramp has limited parking ares, which would be unaffected by higher pool raises. All three would be improved with additional water depth in the approach channel.

3.6.1.4 Marion County--Roberts Creek Park.

3.6.1.4.1 The Roberts Creek area, leased and managed by the Marion County Conservation Commission, consists of 1,535 acres based around a separate impoundment immediately north of Lake Red Rock on County Road G28, about 8 miles west of Pella. The site is owned by the Federal Government but has been leased to the Marion County Conservation Board since 1969. Activities in Robert's Creek Lake include camping, picnicking, fishing, swimming, archery, and boat access.

3.6.1.4.2 The lake pool level of 750 feet NGVD is controlled by the structure at the mouth of the creek. Above 750 feet NGVD, the pool fluctuation in Roberts Creek Lake is essentially similar to Lake Red Rock.

3.6.1.5 Marinas. Areas leased and managed by private owners.

3.6.1.5.1 Red Rock Marina--The Marina Concession Area is leased to a private business and consists of 145 acres located on the western shore of Wallashuck Bay. Facilities include covered boat slips, moorings, a marine fuel service station, and a boat sales and service building located on the shore with a boat ramp and moorings. The marina boat ramp is a two-lane boat ramp in good condition. It is usable up to elevation 780 feet NGVD. There are three levels of parking areas with the lowest level at 735.6 feet, the second level at 742 feet NGVD, and the upper level at 755 feet NGVD. Overall use is considered marginal. The water depth around the dock is shallow at elevation 728 feet NGVD and the mooring area is small. The shoreline in the vicinity of the dock is characterized by a bench at elevations 731 to 733 feet NGVD, which drops off sharply to the water's edge at elevation 728 feet NGVD. This results in shallow water pool elevations from 732 to 736 feet NGVD. Landslides are a problem in the area between the bay and parking lot.

3.6.1.5.2 Northshore Boats--This is a land-based marina leased to private business and consisting of 18 acres located north of North Overlook. Marina services include boat storage, launching, and take-out services. A marine dumping station service for the lake is leased from the Corps of Engineers.

3.6.2 USE AND TRENDS

3.6.2.1 Visitation and use of recreation areas and facilities have fluctuated since development began with a trend of increased use to 1985. Table EIS-9 lists the total annual visitation since 1973. Table EIS-10 illustrates the total annual visitation per recreation area as surveyed in 1985. Recreation areas located immediately adjacent to the dam received more than 50 percent of the total visitations in 1985. Comparing the annual total visitations in table EIS-9 to the total in table EIS-10 shows that visitors are experiencing more than one activity per trip to the area.

3.6.2.2 Recreation activity is illustrated in table EIS-11. The percent of use per activity has varied from 1975 to the present. Sightseeing and picnicking activities as percentages of total use have increased. Camping, fishing and hunting activities are on the decline.

3.7 SOCIO-ECONOMIC ELEMENTS

3.7.1 DATA ANALYSIS AND ASSESSMENT

3.7.1.1 Current project conditions were established following the 1975 FEIS, with the decision to continue existing operation and maintenance procedures but with the conservation pool raised to 728 feet NGVD. Assessment of these conditions must consider various interrelated factors.

TABLE EIS-9

Total Annual Visitation

Year	Visitations
1973	1,015,000
1974	1,089,000
1975	1,140,524
1976	1,172,500
1977	996,404
1978	850,200
1979	830,500
1980	953,600
1981	923,000
1982	883,900
1983	891,300
1984	1,089,800
1985	1,178,348

Source: USCOE, NRMS Database, 1986.

TABLE EIS-10

1985 Visitation Per Recreation Area

Recreation Area	Visitations
Fifield	19,617
Wallashuck East	31,287
North Overlook	117,497
North Tailwater	119,805
Howell Station	195,917
Ivan's	25,534
South Tailwater	100,233
South Overlook	55,123
Whitebreast	64,375
Wallashuck West	63,178
Visitor Center	52,482
Total Corps Area	845,048
Unimproved	161,824
IDNR Wildlife	145,806
Elk Rock	94,972
Roberts Creek	98,643
Total Other Areas	501,245

Source: USCOE, NRMS Database, 1986.

TABLE EIS-11

Percent of Total Use by Activity

Activity	1973	1974	1975	Average (73-75)	1976	1977	1985	Average (76-77-85)	Total Average
Picnicking	5	3	17	8.55	20	9	6	11.67	10.11
Camping	-	-	25	25.00	15	10	8	11	18.00
Swimming	-	-	-	9.00	6	7	2	4.67	6.84
Water Ski	2	2	2	2.00	2	1	1	1.33	1.67
Boating	5	5	5	5.00	4	5	6	5.33	5.17
Sightseeing	30	17	40	29.15	45	39	48	44.00	36.58
Fishing	35	30	2	29.81	20	19	18	19.00	24.40
Hunting	-	-	-	7.00	10	4	1	3.00	5.00
Other	-	-	-	-	2	11	11	8.00	4.00

Source: USCOE NRMS Database, 1986, compiled by ESE.

3.7.1.2 Population

3.7.1.2.1 Population data for the study area have been compiled using official Bureau of Census information as prepared by the U.S. Department of Commerce. The 1975 population figures result from interpolation of official census data for 1970 and 1980, representing current population at the time of the 1975 FEIS.

3.7.1.2.2 Future population projections for the counties of interest to the year 2000 were obtained from the 1986 Statistical Profile of Iowa as published by the Iowa Development Commission. Those counties within a 50-mile radius of Lake Red Rock are defined as the primary market area for the project and were analyzed for population trends as shown in table EIS-12. Analysis of this population data (table EIS-12) shows a significant variance of growth within the state and segments of the study area. Population growth from 1975 to 2000 is projected for the State of Iowa at +3.3 percent, 22-County Market Area at +6.6 percent, 4-county area at +10.9 percent, and Marion County at +16.0 percent.

3.7.1.2.3 The amount of increase in population attributable to the presence of Lake Red Rock cannot be measured, but it is likely a positive factor in the growth projections. Further verification of this relationship is found by analyzing historical population data prior to 1975 as shown in table EIS-13. A review of past population figures confirms that Marion County's population reached a peak in 1940, then declined the following two decades. The 1970 census showed a slight gain coincident with completion of construction and start of operation of the lake. A significant increase then occurred from 1970 to 1980.

3.7.1.2.4 Population growth becomes an important factor in the Lake Red Rock community for two primary reasons: (1) there is a requirement for additional permanent residential units in the immediate vicinity, and (2) there is an increasing need for facilities and physical capacity to handle larger visitation numbers each year.

3.7.1.3 Economic Conditions and Trends in Urbanization and Economic Growth

3.7.1.3.1 Lake Red Rock is situated in an area which not only experiences a higher population growth rate than most of the state but also enjoys a more favorable economic condition. A primary indicator is the unemployment rate for the immediate four-county area as compared to the state level.

3.7.1.3.2 The following statistics represent 1984 unemployment rates as compiled by the Bureau of Labor Statistics, U.S. Department of Labor:

Jasper County	7.2%
Marion County	3.7%
Polk County	6.0%
Warren County	4.4%
State of Iowa	7.1%

TABLE EIS-12

Population Data, State of Iowa and Study Area Counties

	1975	1980	1985	1990	1995	2000
State of Iowa	2,869,425	2,913,808	2,905,400	2,913,500	2,931,800	2,965,000
Appanoose	15,266	15,511	14,900	14,500	14,300	14,400
Boone	26,327	26,184	25,900	25,800	25,600	25,500
Clarke	7,597	8,612	9,100	9,400	9,800	10,000
Dallas	27,800	29,513	29,200	28,900	28,800	28,900
Davis	8,656	9,104	9,400	9,800	10,100	10,400
Decatur	9,766	9,794	9,200	8,800	8,600	8,600
Iowa	15,424	15,429	15,200	15,100	15,000	15,000
Jasper	35,925	36,425	35,900	35,600	35,300	35,100
Keokuk	13,432	12,921	12,500	12,200	12,000	11,900
Lucas	10,238	10,313	10,400	10,600	10,700	10,800
Madison	12,078	12,597	12,600	12,600	12,700	12,800
Mahaska	22,522	22,867	22,500	22,200	22,100	22,200
Marion	28,011	29,669	30,500	31,300	32,000	32,500
Marshall	41,364	41,652	42,500	43,300	44,000	44,600
Monroe	9,283	9,209	9,100	9,000	8,900	8,900
Polk	294,650	303,170	309,900	316,100	321,600	326,900
Poweshiek	19,055	19,306	18,600	18,200	17,900	17,800
Story	67,555	72,326	72,900	73,300	75,200	78,500
Tama	19,840	19,533	19,200	19,000	18,800	18,800
Wapello	41,195	40,241	39,100	38,100	37,300	36,800
Warren	31,155	34,878	35,400	36,100	36,900	37,800
Wayne	8,302	8,199	8,100	7,900	7,800	7,800
22-County Total	765,441	787,453	792,100	797,800	805,400	816,000
Jasper, Marion Polk, Warren 4-County Total	389,741	404,142	411,700	419,100	425,800	432,300

Source: Iowa Development Commission, 1986.

TABLE EIS-13

Historical Population Data

	1920	1930	1940	1950	1960	1970
State of Iowa	2,404,021	2,470,939	2,538,268	2,621,073	2,757,537	2,824,346
Appanoose	30,535	24,835	24,245	19,683	16,015	26,470
Boone	29,892	29,271	29,782	28,139	28,037	26,470
Clarke	10,506	10,384	10,233	9,369	8,222	7,581
Dallas	25,120	25,493	24,649	23,661	24,123	26,085
Davis	12,574	11,150	11,136	9,959	9,199	8,207
Decatur	16,566	14,903	14,012	12,601	10,539	9,737
Iowa	18,600	17,332	17,016	15,835	16,396	15,419
Jasper	27,855	32,936	31,496	32,305	35,282	35,425
Keokuk	20,983	19,148	18,406	16,797	15,492	13,943
Lucas	15,686	15,114	14,571	12,069	10,923	10,163
Madison	15,020	14,331	14,525	13,131	12,295	11,558
Mahaska	26,270	25,804	26,485	24,672	23,602	22,177
Marion	24,957	25,727	27,019	25,930	25,886	26,352
Marshall	32,630	33,727	35,406	35,611	37,984	41,076
Monroe	23,467	15,010	14,553	11,814	10,463	9,357
Polk	154,029	172,837	195,835	226,010	266,315	286,101
Poweshiek	19,910	18,727	18,758	19,344	19,300	18,803
Story	26,185	31,141	33,434	44,294	49,327	62,783
Tama	21,860	21,987	22,428	21,688	21,413	20,147
Wapello	37,937	40,480	44,280	47,397	46,126	42,149
Warren	18,047	17,700	17,695	17,758	20,829	27,432
Wayne	15,378	13,787	13,308	11,737	9,800	8,405
22-County Total	624,008	631,824	659,272	679,804	717,568	744,377
Jasper, Marion Polk, Warren 4-County Total	224,888	249,200	272,045	302,003	348,312	375,310

Source: Iowa Development Commission (various years)

3.7.1.3.3 Employment trends for the area are favorable. The Marion County Board of Supervisors has forecasted a 3.5 percent increase in employment between 1986 and 1990 for those major employers located within the county. The cities of Knoxville, Pella, and Oskaloosa each project optimistic employment conditions. Each emphasizes the accessibility to Lake Red Rock among community assets listed in promotional materials to attract potential business, industrial, and residential development. Population growth and employment opportunities are key factors in determining residential development.

3.7.1.3.4 Lake Red Rock offers aesthetic appeal for homesites with its open space characteristics and limited noise and air pollution, in addition to its recreational appeal. Eight residential subdivisions currently exist in areas adjacent to project lands and they are mostly in early stages of development. Improvement in the various factors of lake operation and use will enhance development, further contributing to community economics. These subdivisions are within easy commuting distance of employment opportunities in local cities and within feasible commuting distance of the Des Moines metropolitan area. Highway modification to State Highways 5 and 92 planned by the Iowa Department of Transportation will improve commuting capability for even greater distances.

3.7.1.3.5 Analysis of the number of housing units in the four-county area shows significant growth during the census decade 1970 to 1980.

County	Total Housing Units 1970	1980	Increase
Marion	8,577	11,021	+28.5%
Jasper	12,238	14,447	+18 [illegible]%
Polk	98,268	122,136	+24.[illegible]%
Warren	8,413	12,177	+44.7%

3.7.1.3.6 While the rural population in the state and the affected area is decreasing, the size of farms is increasing. For example, in 1983 there were 1,240 farms in Marion County averaging 255 acres, compared to 1,508 farms averaging 207 acres in 1970. Property values have declined because of the poor farm economy and the resulting reduction in the number of farm dwellings and farm buildings.

3.7.1.3.7 The trend toward urbanization will generally result in a positive impact on regional tax revenues. The taxation rate for agricultural land is less than that for residential property; the addition of residential dwelling value increases the tax base for a given parcel of land. This increase in tax revenues will help support future needs for governmental services without unnecessary burden to the rest of the community.

3.7.1.4 Institutions

3.7.1.4.1 Institutions providing services to the area surrounding Lake Red Rock are essentially those within Marion County. A listing of these institutions was provided by the Marion County Board of Supervisors and

was supplemented by community reference information from the Iowa Development Commission. These institutions include several educational facilities, three hospitals, and nearly 60 churches, as detailed below:

° School Districts (5)
  - Knoxville
  - Pella
  - Pleasantville
  - Twin Cedars
  - Melcher-Dallas

° Churches

- Knoxville	26
- Pella	17
- Pleasantville	4
- Other locations in Marion County	11
TOTAL	58

° Colleges
  - Pella Central College

° Other Educational Institutions
  - Pella Christian Opportunity Center for Handicapped

° Hospitals
  - Knoxville Area Community Hospital
  - Knoxville Veterans Administration Hospital
  - Pella Community Hospital

3.7.1.4.2 The County Board of Supervisors has evaluated the capabilities of existing institutions to meet current requirements and has expressed the opinion that all are adequate.

3.7.1.5 Social Relationships and Human Well Being--Social Problems Resulting From Project Operations

3.7.1.5.1 Population and economic trends have been analyzed for impact on social relationships and human well being. With conditions being essentially stabilized in the operation phase of the project since the 1975 FEIS, community social impact can be effectively assessed. Service needs for all of Marion County are adequately met by various agencies and organizations. Fire protection is provided by eight separate city/rural fire departments utilizing volunteer personnel. Law enforcement is handled by five city police departments, the Marion County Sheriff's Department, the Corps of Engineers Park Rangers, and the County Board of Supervisors.

3.7.1.5.2 Health care facilities and staffing are also considered adequate with no projected additions in the immediate future. The facilities include hospitals, nursing homes and a county health care unit. No changes in service, service area or extent of service are anticipated.

3.7.1.5.3 Educational requirements have been adequately met at all levels. School facilities and programs are considered to be of high quality. Despite the growing population base, there have been no problems reported in regard to overcrowding.

3.7.1.5.4 Employment opportunities remain high, as indicated by Marion County's low unemployment rate. In 1984, Marion County's unemployment was only 3.7 percent, according to the U.S. Department of Labor. Only two counties within the State of Iowa reported lower rates. Low unemployment rates have been experienced in Marion County for several years, as reported by the Bureau of Labor Statistics.

3.7.1.6 Existing Types and Extent of Recreational Opportunities and Aesthetic Conditions

3.7.1.6.1 In addition to recreational opportunities directly associated with the Lake Red Rock project, recreation facilities and activities within local communities have added to the overall appeal of the area. For example, the community of Pella, located 3 miles northeast of Red Rock Dam, offers unique ethnic, cultural, and historical features to attract tourism. Knoxville, situated 7 miles south of Lake Red Rock, features summertime sprint car racing, which has national recognition. The attractions offered in these communities have added to the recreational appeal of the Lake Red Rock area.

3.7.1.6.2 Aesthetic elements at the lake continue to be a factor influencing recreational value. The psychology of visual impressions results in positive or negative reactions with long-lasting effects. Notable existing negative factors include prevailing mudflats, dead trees, and shoreline erosion which are believed to be directly responsible for the recent decline in sightseeing activity as a percent of total visitation numbers. Sightseeing increased from 1983 to 1985, however, 1986 sightseeing was below 1983 levels.

3.7.1.6.3 The primary example for this condition is the view from State Highway 14, a primary road which carries a significant amount of traffic not necessarily associated with lake activities. This highway exposes travelers to excessive tree kill; mudflats; an eroding, unvegetated shoreline ring; and a limited view of open water which create a negative response not inducive to sightseeing or extended visitation.

3.7.1.6.4 Raising the conservation pool would inundate some of the present areas of negative aesthetics, presenting a shoreline appearance having more favorable water and vegetation quality. The psychological impressions would carry over toward a positive evaluation of total project quality.

3.7.1.7 Air Quality and Noise. Assessment of current conditions at the Lake Red Rock project indicates no serious problems of air quality or noise. Seasonal conditions of smoke, vehicle exhaust emissions and noise associated with camping, picnicking, boating, and automobile traffic are typical for a lake recreational area. Because these conditions rapidly dissipate in the rural environment, there is no reported negative public reaction at the present operational level.

3.7.1.8 Energy Consumption and Uses

3.7.1.8.1 Energy considerations are not a significant factor in assessment of Lake Red Rock operations for two primary reasons: First, operation of the dam and related lake facilities at the present operating level has established energy requirement for varying water flows over several years. Second, the licensed hydroelectric development at Lake Red Rock will be a run-of-the-river facility and will not affect, or be affected by, a pool raise.

3.7.1.8.2 Energy availability from public and municipal utility companies is adequate for current conditions and no change is anticipated.

3.8 CULTURAL RESOURCES

3.8.1 Four hundred and twenty (420) cultural resources sites, for which locational data are available, lie on federally-controlled lands at Lake Red Rock. These sites represent approximately 7,000 years of prehistory and history beginning with the Early Archaic period and culminating in the middle twentieth century. Of these 420 sites, 11 sites below 760 feet NGVD have been determined eligible for the National Register of Historic Places (NRHP) based upon their demonstrated ability to yield data of importance to the history and prehistory of the region. It is anticipated that the mitigation of these 11 sites will be completed by the fall of 1988.

3.8.2 Normal operation of the lake for flood control purposes has frequently necessitated allowing the lake level to reach elevations of greater than 748 feet. As a result, lands along the shoreline from elevations 728 to 748 feet NGVD are severely eroded, a process which is ongoing. Field visits to several sites within this elevation range have shown that these cultural resources have already been severely impacted. Lesser impacts occasionally occur up to the maximum flood control pool elevation of 780 feet NGVD. The main impact at the higher elevations is the destruction of protective ground cover, promoting vandalism and erosion.

3.8.3 The cultural resources overview is presented in Chapter 13 of the report entitled Archeological Survey and Testing at Lake Red Rock, Iowa: The 1984 and 1985 Seasons (Roper 1986). For sites in and around Lake Red Rock south of the Bemis Moraine, Roper's lithic and ceramic typologies would apply, as would Roper's analysis of settlement patterns, resource availability/procurement and site distributions. A summary of prehistoric cultural manifestations is presented in table EIS-14. Roper (1986) proposed the following topical study units for the historic period:

Early Contact	
Early Exploration and Settlement	1600-1846
General Farming Era	1830-1880
Crop/Livestock Specialization	1880-1940
Related Industries: Mills, Elevators, Meat-Packing	
Coal Mining and Stone Quarrying	
Manufacturing of Ceramics and Other Items	
Emerging Settlements and Town Building	1830-1940
Transportation: River and Road Era	1830-1880

Transportation: Railroad Era	1844-1900
Transportation: Automobile and Paved Road Era	1900-1940
Origins of the Population and Ethnic Presence	
Religious Expression	
Fraternal and Social Organizations	

TABLE EIS-14

Lake Red Rock Prehistoric Chronology

Period	Date Range	Diagnostic Artifacts	Diagnostic Features	Relevant Landforms	Subsistence	Comments
PaleoIndian		fluted points (clovis, folsom); only later Plano forms found (Angostura)	none identified		nomadic w/focus on larger game; upland focus	no evidence from undisputed contexts
Early Archaic	10,000-8,000 B.P.	side- and corner-notched points (Cherokee and Kirk)		Late Wisconsinan and Early Holocene features degraded or buried by alluvium; sites on fan remnants and uplands		
Middle Archaic	8,000-5,000 B.P.	Side-notched (Godar, Tama, Raddatz) and stemmed (Jackie) points				small residential/extraction sites
Late Archaic	5,000-2,500 B.P.	stemmed (Table Rock)			general residential mobility	evidence sparse; unattractive due to low productivity and biotic diversity
Early Woodland		only 2 sherds to date; Kramer points and incised-over-cord-marked pottery expected				ephemeral
Middle Woodland	2,500-1,500 B.P.	Havana-related stamped and noded ceramics like High Bridge ware from Saylorville Lake (Van Hyning Phase; some Weaver-like Madrid ware (Saylorville Lake archetype)	bluff crest conical burial mounds	alluvial fans and terraces	base camps on alluvial fans and terraces; extractive camps along bluff crests and on floodplain features such as levees and meander loop edges	no true Hopewell material
Late Woodland	1,500 - 600 B.P.	Great Oasis and Riverbend ceramics; small notched and unnotched points	large village sites; small extractive camps; small burial mounds			largest number of sites, possibly due to recentness and context; older sites are more likely to be buried or eroded
Oneota	850 - 300 B.P.	Moingona Phase shell tempered ceramics w/geometric designs; small unnotched triangular projectile points; end scrapers; shaft abraders	small villages and hamlets; daub	elevated portions of river bottoms	corn, bison, small game and plants	

SECTION 4 - IMPACTS UPON ENVIRONMENT

4.1 SUMMARY OF EFFECTS

4.1.1 As part of resource management at Lake Red Rock, the Corps has used a habitat-based compartmental Natural Resource Management System (NRMS) for the project. Recent aerial photography, photointerpretation, and ground-truthing of discrete habitat segments were the basis for classification of project lands into habitat types such as grassland, forbs/broadleaf, wetlands deciduous forest, etc.

4.1.2 Data contained in the NRMS were used to evaluate impacts and determine acreages of habitat types affected by the pool raise alternatives. However, flooding, erosion, and sedimentation at lower elevations have altered previous shorelines, landforms and vegetation patterns over the last several years, including the period of development of this report. This may have rendered some 1985 habitat acreage data contained in the NRMS obsolete. Acreages discussed here represent estimates using the best available data.

4.1.3 The potential impacts to resources in the area caused by the various proposed conservation pool raise alternatives are presented in this section. Since all of the nonselected alternatives would ultimately lead to a pool raise to 742 feet NGVD, many of the impacts would ultimately be the same. In addition, many of the impacts for the intermediate pool raises are the same as for 742 feet NGVD but involve proportionally smaller acreages of identical mudflat or forb habitat. Table EIS-2 presents a summary of the impacts for the various alternatives.

4.1.4 All nonselected alternatives would involve eventual modification or relocations of four recreation and lake access sites. These are shown on plates EIS-1 through 5 and are described below:

4.1.4.1 North Overlook Beach

4.1.4.1.1 This area was part of the original borrow area used for construction of the dam and, as such, has no natural vegetation. The proposed parking lot and part of the beach would be on about 3 acres of ground where bluegrass has been established. The remainder of the new beach area, about 1 acre, would be in an area that is now gravel parking lot (see plate EIS-1).

4.1.4.1.2 Summary effects of this modification involve temporary disruption of terrestrial fauna utilizing this area for travel or forage. Current foraging is limited by human use of the area. Following modification, wildlife use should return to pre-construction levels. All construction would occur prior to increases in lake elevation; therefore, beach grading, sand placement, and roadway construction would not require evaluation under the Clean Water Act (see plate EIS-2).

4.1.4.2 Wallashuck East Recreation Area

4.1.4.2.1 The new parking lot for this ramp would be built in a brome and bluegrass field roughly 2 acres in size. Part of this area was disturbed during construction of the campground when a berm was placed between the campground and the lake. The berm was later removed. The ramp would be built in an area below eventual pools that is presently barren but is normally in annual forbs. This would convert about one-half of an acre from bare soil to pavement. Construction would occur prior to a pool raise and also would not require evaluation under the Clean Water Act (see plate EIS-3).

4.1.4.2.2 Summary effects to natural resources involve loss of foraging habitat and nesting cover for field and meadow species.

4.1.4.3 Wallashuck West Recreation Area

4.1.4.3.1 The short connecting road that would need to be built here would be in an area presently covered by riprap and/or sparse annual forbs (± 1/2 acre) (see plate EIS-4).

4.1.4.3.2 No effects are anticipated from this modification.

4.1.4.4 Whitebreast Recreation Area

4.1.4.4.1 All lands below elevation 779 feet NGVD in this area have been flooded at varying intervals and have no permanent vegetation. Below elevation 750, about 2 acres is barren at this time with annual forbs normally present. Between elevations 750 and 779 about 1 acre is covered with a variety of annual forbs and grasses with a few invading willows and cottonwoods. Above elevation 780, approximately 2 acres of affected area is covered by a combination of pole-sized elm and honeylocust trees, with a few other species present in limited numbers. About 2 acres is old brome grass field where tree plantations have been established.

4.1.4.4.2 Of the roughly 7 acres affected by this relocation, only 4 contain habitat usable on a permanent basis. Wildlife use of the area would typically consist primarily of shrub-nesting birds. Following construction, landscaping of this area may be anticipated to restore some nesting habitat. Elevated human use of this area with reduced human use at abandoned ramp sites may produce a shift in wildlife use and foraging patterns in the Whitebreast area over the next several seasons.

4.1.4.4.3 Construction of relocated facilities subject to eventual inundation is anticipated to be carried out prior to a pool raise. This precludes the need for evaluation of this activity under the Clean Water Act (see plate EIS-5).

4.2 ECOLOGICAL RESOURCES

4.2.1 TERRESTRIAL RESOURCES

4.2.1.1 Impacts to terrestrial resources relate to the relative value of habitat flooded by each alternative and the possible effect on waterfowl food support. With each alternative, habitat losses and faunal displace-

ments may ultimately be expected. Short-term impacts to waterfowl habitat, however, are likely to be higher with Alternative 2. This primarily relates to the loss of available foraging habitat (seeded) during fall migration. Habitat in the zone between 728 and 742 feet NGVD involves mainly level river valley bottomlands which have been repeatedly flooded during reservoir operations over the last 16 years. Periodic inundation will continue in this zone over the life of the project. This property includes agricultural leased land, dead standing timber, and large expanses of mudflats, which, as conditions permit, are either seeded to wildlife food species or colonized by annual forbs and tree seedlings.

4.2.1.2 No Action

4.2.1.2.1 The future without conditions, resulting from No Action, will vary with each year's precipitation and hydrological conditions. During relatively dry years, the mudflats would be expected to be covered first in annual forbs such as smartweed, ragweed, pigweed, and then giving way to willow thickets, silver maple, and cottonwoods. Under these conditions, the braided shallows of the Des Moines and pool delta area could be expected to display early wetland development by arrowhead and cattail colonization as well as perennial smartweed growth. Higher elevations would display seral development from foxtail, ragweed, and goldenrod to box elder, sumac, elm, and honey locust.

4.2.1.2.2 This alternative, also called the 90/50 Plan, would provide little immediate change in aquatic habitat due to anticipated continued sediment buildup in the main lake body, Highway 14 delta area, and tributary embayments. Pool raises to regain storage may not provide enough habitat diversity for long enough to improve spawning success.

4.2.1.3 Alternative 1

4.2.1.3.1 The current plan of operation involving periodic raises to maintain 90/50 would be slightly altered by changing release rates. This could allow slightly faster drawdown to relieve flooding stress on terrestrial environs in the reservoir pool area. This method of operation could increase survivability of certain vegetative types in the reservoir pool area, as well as improve conditions for moist soil management in the wildlife area.

4.2.1.3.2 However, these release rates are not anticipated to change downstream erosion rates or to significantly alter flood effects. Therefore, there is no difference between this alternative and the No Action alternative, or Alternatives 2, 3, and 4 regarding downstream effects.

4.2.1.4 Alternative 2

4.2.1.4.1 This is the single-step raise to elevation 742, Plan 2. Acreage information discussed represents aerial photographical and fee area compartmental data on habitat acreages between elevations 730 and 743 feet NGVD.

Of the approximate 10,000 acres between these elevations, an estimated 6,500 acres are of a forb/mudflat habitat type; 2,500 acres are agricultural leases; 800 acres are brush (scrub-shrub); and 200 acres are man dominated (recreation access).

4.2.1.4.2 Under the current operating plan, terrestrial species which colonize lower elevations during dry periods are directly killed or displaced during flood events. Displaced individuals are then subject to population-limiting factors in the habitat surrounding the reservoir. No habitat type inundated by this alternative is unique or of exceptionally high value in the project area. Indeed, the frequency of inundation often makes these areas unsuitable for nests, dens, and burrows; the extent to which these habitats may be exploited by faunal groups is therefore very limited. Under existing operating conditions, mudflats are annually seeded with millet to provide a food source for fall waterfowl. In addition, waterfowl subimpoundements in the Swan Refuge may be inundated with greater frequency due to their proximity to the anticipated reservoir shoreline. Alternative 2 could therefore result in the short-term loss of waterfowl habitat (mudflat and subimpoundment) until a new mudflat zone develops and subimpoundments are redeveloped or improved. Emergent wetlands could form in the coves of the middle reservoir in response to higher, more stabilized pool levels, thus ultimately enhancing waterfowl habitat. However, anticipated flood-induced pool fluctuations will limit emergent wetland development throughout the reservoir.

4.2.1.5 Alternative 3

4.2.1.5.1 A two-step pool increase to 736 and then to 742 feet NGVD would ultimately result in equivalent habitat changes as compared with Alternative 1. These losses would be stepwise, allowing for continued aerial seeding of mudflats and no short-term loss of fall waterfowl habitat. This alternative also would allow the time necessary to improve or redevelop waterfowl subimpoundments. Depending upon flood-induced pool fluctuations, natural emergent wetland development in the coves of the upper reservoir may not be extensive at elevation 736 feet NGVD.

4.2.1.5.2 Other anticipated effects to natural resources from Alternative 3, a two-step raise, involve enhancement of fishery potential from cove flooding and expansion of deep water, 2 meters or greater, by about 3,800 acres. Aquatic habitat gains (discussed in Section 4.2.2) are compared to terrestrial habitat losses. However, over the life of the project, terrestrial habitat value in the reservoir will vary from season to season as flood events kill off colonizing annuals, tree seedlings, and other flood-intolerant vegetation. Periodically flooded and exposed areas are most useful from the waterfowl standpoint as they provide resting and feeding cover during migration periods. As conditions permit, mudflats and flood-killed zones are seeded with food plants which are then flooded during a fall pool raise to attract waterfowl.

4.2.1.5.3 It is anticipated that about 12 years would elapse before the final pool raise would be made to 742 feet NGVD. During this period, sediment entrapment in the reservoir would continue, with the zone of

delta formation being primarily upstream of the Highway 14 bridge, versus downstream as presently occurring. Mudflats and kill zones would occur in and around the pool at 736 feet NGVD and would provide much the same potential for seeding and other wildlife management as currently exists with the pool at 728 feet NGVD.

4.2.1.6 Alternative 4. As with Alternatives 2 and 3, this alternative would result in equivalent conversion of terrestrial habitat. Compartmental data available for habitat between elevations 728 and 732 feet NGVD indicate that this is entirely mudflat and forb land. Permanent displacement of wildlife would be comparable to other alternatives, but would be less abrupt, occurring over a longer time period. As with Alternative 2, no disruption of aerial mudflat seeding would occur with a three-step pool raise. Similarly, natural wetland development in upper reservoir coves probably would not be extensive until some time after the final pool raise. The extent of this wetland development would correspond to the stability of the conservation pool.

4.2.1.7 Alternative 7. This plan arose from the need to balance all authorized project purposes (flood control, fish and wildlife conservation, and recreation) and is the recommended alternative. Differences between Alternative 7 and other alternatives involve acreage conversion.

4.2.1.7.1 This alternative is anticipated to add roughly 5,000 acres to the lake's surface area by permanent inundation of periodically flooded habitat. This represents a loss of intermittently available terrestrial habitat. This habitat has supported scrub-shrub growth and leased agriculture during drier years, smartweed and Japanese millet (when seeded) during medium-precipitation years, and unvegetated mudflat during wet years.

4.2.1.7.2 Depending on land use trends in the Des Moines River watershed, and annual precipitation, the mudflats resulting from sedimentation are anticipated to reappear in the vicinity of the Highway 14 Bridge. This essentially means that existing habitat conditions will reoccur at some future point, along with identical vegetative species and patterns.

4.2.2 AQUATIC RESOURCES

4.2.2.1 No significant adverse effects to the aquatic resources of Lake Red Rock or the Des Moines River downstream from the proposed pool raise are anticipated. A number of potential changes could, in fact, benefit the fishery, especially that of Lake Red Rock. These positive impacts would include: larger resource due to significant increase in reservoir area/volume; improved access to tributaries, providing refuge and cover, as well as potentially enhancing recruitment of species utilizing streams for spawning (e.g., walleye, northern pike, etc.); increase in shallow water areas should benefit non-pelagic/littoral species; upper portion of

reservoir could develop aquatic macrophyte beds during drier years, providing excellent cover and spawning habitat, as well as epibenthic food sources; and increased stability of water level within reservoir as well as increased littoral zone should enhance spawning success and reproductive potential.

4.2.2.2 No Action.

4.2.2.2.1 This alternative would result in the maintenance of current conditions. The lake surface acreage would continue to be lost to sediment accretion with each pool raise, whereupon accretion will continue slightly upstream.

4.2.2.2.2 Benefit to the fishery from each pool raise is anticipated to be minimal and temporary due to stairstep mudflat accretion in the vicinity of the Highway 14 bridge and tributary confluence zones around the lake.

4.2.2.2.3 Benthic communities will remain unchanged both in the pool and the Des Moines River downstream.

4.2.2.2.4 Water quality will remain unchanged.

4.2.2.3 Alternative 1, Current Plan With Increased Release Rates. This alternative would present identical impacts as the No Action alternative, except that faster drawdowns could reduce the value of flooded shallows as spawning and breeding habitat. Refer to paragraphs 4.2.2.4.7 and 8 for release rate discussion.

4.2.2.4 Alternative 2, 1-Step Raise.

4.2.2.4.1 A single pool raise to elevation 742 feet NGVD would increase the available volume and littoral zone of the reservoir at conservation pool elevation. This will provide a significant increase in diversity of available habitats (especially shallow water habitats), and should allow for some diversification of the fishery, especially fishes important as a forage base (e.g., shad, minnows, shiners, sunfishes). The lake surface area would be initially increased by about 10,000 acres. Results of this alternative would be similar to other alternatives in that the lake acreage will continue to be lost to sediment accretion. The lake area lost will not be so apparent until mudflats are developed. It is unlikely that they can be reclaimed or inundated.

4.2.2.4.2 The shallow-water zones in the main lake, which would be continuously inundated with the pool raise, could develop some degree of aquatic macrophyte growth, depending on fluctuation. With greater pool level stability, macrophyte beds could develop and provide improved substrates for a number of benthic faunal groups (e.g., amphipods, isopods, snails, etc.) which are not presently common and would provide a valuable fish food source. These areas would provide excellent cover and spawning/nursery habitat for fish. This would be especially valuable for the centrarchids, northern pike, and the numerous other species typically utilizing vegetated littoral and shallow-water habitats. Cover and

nursery habitat are presently quite limited in Lake Red Rock, and the development of extensive vegetated shallow-water areas should enhance the fishery through improved reproductive success and recruitment.

4.2.2.4.3 Fisheries management surveys conducted in 1983 and 1986 by the IDNR have found that higher continual water levels during the spring spawning period in Lake Red Rock have resulted in higher reproductive success, as indicated by large numbers of young-of-the-year collected in late summer sampling. Similar effects have been found in other reservoirs, and investigators have found that higher spring water levels are especially valuable for increasing spawning and reproductive success, if vegetation is inundated and if the higher water levels are stable (Groen and Schroeder 1978; Beam 1983). While higher water levels in Lake Red Rock have resulted in improved fishery recruitment, no tendency toward a "boom and bust" condition has been reported or is anticipated as a result of permanently increased lake levels.

4.2.2.4.4 Another benefit of the one-step pool raise would be improved access to tributaries and the potential habitats provided therein. This would be especially beneficial to those species utilizing streams or tributaries for spawning purposes (e.g., walleye). Recruitment into the reservoir from tributary fish populations also may be expected to increase.

4.2.2.4.5 Plankton standing crops are expected to increase, to some degree, with this alternative, thus benefitting planktivorous fish (e.g., gizzard shad) and subsequently the predators feeding upon them.

4.2.2.4.6 Overall, it is not anticipated that Alternative 2 would adversely impact the existing benthic invertebrate communities of Lake Red Rock or those of the Des Moines River downstream. The existing benthic communities within Lake Red Rock are typical of those associated with soft (silt-clay) substrates within lentic systems. This is not anticipated to change noticeably. Benthic communities of the Des Moines River below Lake Red Rock include those associated with soft substrates as well as cobble-gravel riffles in lotic systems. Again, this is not anticipated to change significantly.

4.2.2.4.7 The slightly higher allowable discharges may affect the riffle areas to some extent, as they may experience slightly deeper water for longer periods of time. However, the overall benthic community composition should not be altered significantly.

4.2.2.4.8 No significant water quality changes which would impact benthic organisms have been projected to occur with any pool raise. Thermal stratification within the main reservoir will be more pronounced and of longer duration at the 742-foot elevation. However, the benthic organisms associated with this zone (chironomids, worms) are adapted to the low-oxygen or anoxic conditions potentially occurring during extended periods of stratification. The discharge of hypolimnetic water during periods of stratification is also not projected to result in stress to organisms downstream, as re-aeration is expected to occur quickly and the period of discharge of anoxic or low-oxygen waters is not expected to be of long duration.

4.2.2.4.9 The planktonic communities of Lake Red Rock would probably not be adversely impacted by the proposed pool raise. In fact, enhancement of planktonic productivity may occur from increased reservoir retention times and reduced turbidity. These changes should favor the development of higher standing crops of zooplankton and phytoplankton. It is not anticipated that phytoplankton standing crops would reach a nuisance or "bloom" level, based upon nutrient concentrations, turbidity, and the relatively high flushing rate (even with the pool raise).

4.2.2.4.10 The increased plankton standing crop within Lake Red Rock would potentially result in larger numbers of planktonic organisms discharged to the Des Moines River. This increase would be short-lived, as planktonic organisms are typically quite quickly eliminated from lotic systems by predation, physical destruction, and absence of recruitment/reproduction.

4.2.2.5 <u>Alternative 3, 2-Step Raise</u>.

4.2.2.5.1 It is anticipated that Alternative 3 would enhance the fishery of Lake Red Rock over existing conditions. This is primarily due to the anticipated potential greater pool stability at elevation 742 feet NGVD. Details of these effects are discussed in Section 4.2.2.4. An initial increase in the conservation pool to elevation 736 feet NGVD is not likely to have any advantages over a single-step raise (Alternative 2). Differences such as less macrophyte development and reduced reproductive success and recruitment may result from slightly less pool stability (at elevation 736) and insufficient time for macrophyte establishment (depending on fluctuation time between pool raises). This alternative may, in the short run, provide slightly less habitat for fish and benthos, result in less extensive macrophyte development depending on fluctuation, and reduce more standing crops of zooplankton and phytoplankton than Alternative 2.

4.2.2.5.2 While this alternative would not provide as much initial volume as the single-step pool raise, it is anticipated to stabilize aquatic conditions in the main lake area by moving the sediment accretion areas farther up the river and tributary valleys. However, sedimentation will eventually encroach upon the main lake, at which time the lake could be raised to elevation 742 feet NGVD to regain lost aquatic habitat.

4.2.2.5.3 This alternative may serve to maximize aquatic benefits by staging sedimentation and storage recovery events twice over the life of the project. The advantage of this alternative over more stepped raises is that the immediate volume and habitat gains are likely greater than with several smaller steps.

4.2.2.6 <u>Alternative 4, 3-Step Raise</u>. Like Alternative 3, the degree to which a three-step pool raise will impact the aquatic resources relates to pool stability, habitat diversity, and the increase in deepwater area. Ultimately, the fishery will be enhanced as discussed with Alternative 2. However, intermediate pool levels (elevations 732, 736) represent less

advantages for the aquatic resources than the 1- or 2-step alternatives. These intermediate pool levels represent periods of slightly less benthic stability than that provided at elevation 742 feet NGVD. They therefore will, to a lesser degree, promote macrophyte bed development and, consequently, less cover and food chain support. Each pool increase will, however, increase the overall littoral zone of the reservoir and thus result in some fishery enhancement.

4.2.2.7 Alternative 7 (Preferred Alternative). Similar to the first step of Alternative 3, a raise to elevation 734 will provide proportionally less deep and shallow water habitat than Alternative 3. At elevation 734, the effects of sedimentation are anticipated to appear sooner and could negate aquatic habitat gains before another lake level change is approved and implemented. However, as mentioned in 4.2.2.6, preceding, any pool increase will initially increase the overall littoral zone of the reservoir and thus result in some fishery enhancement.

4.2.3 THREATENED AND ENDANGERED SPECIES BIOLOGICAL ASSESSMENT

4.2.3.1 All Alternatives

4.2.3.1.1 Pool raise alternatives are not likely to impact federally threatened or endangered species in the project area. Bald eagles, wintering in the area, are typically associated with ice-free riparian areas. Since no changes will occur to these habitat characteristics, no impacts are expected. The Indiana bat, also associated with riparian habitats, might be expected to adjust its foraging areas upstream slightly in response to higher water elevations. No overall impact, however, is likely to occur.

4.2.3.1.2 Since most State-listed threatened and endangered species are typically found in upland areas or some distance from the project area (reference IDNR letter dated December 11, 1986, contained in Appendix I - Pertinent Correspondence of the main report, and see table EIS-4), no impact to these species is expected with any alternative. The river otter, recently reintroduced into Lake Red Rock, may be expected to adjust its distribution upstream in accordance with the degree of the pool raise.

4.2.3.2 While a step-wise pool raise is not likely to result in any impacts to threatened or endangered species, the river otter may suffer from multiple displacements with each pool raise. Because of the recent current pool level dynamics, resident otters are believed to avoid the zone of large fluctuation and remain in the upper reservoir and its tributaries. The proposed single-step pool raise is not anticipated to affect threatened or endangered species. In fact, the proposed regulation changes will reduce flood frequencies at certain elevations, thereby reducing flood effects on the upper reservoir and its wildlife.

4.2.3.3 For the reasons stated above, the alternatives presented in this report are not anticipated to affect any federally or State-listed endangered species. Further action under Section 7 of the Endangered Species Act of 1973, as amended, is not planned at this time. Reference U.S. FWS Coordination Act Report, dated March 21, 1988, contained in Appendix 1, Pertinent Correspondence, of the main report.

4.3 GEOTECHNICAL ELEMENTS

4.3.1 It is not anticipated that the present character of the area would be greatly altered. Impacts of erosion will be the most visible consequence. Soils in the area of the shoreline are generally silt loams with little, if any, clay in the upper 50 inches. These soils are friable and are susceptible to erosive forces. Erosion occurring along the lakeshore is typically deposited nearby in the lake such that mass removal of material is not observed. Erosion is pronounced after prolonged periods of high water resulting in loss of vegetation and its stabilizing influence. However, erosion is substantially diminished below the conservation pool surface as the limit of wave base action is reached. Furthermore, shoreline slopes at higher pool elevations are predominantly slight (0 to 5 percent) to moderate (6 to 15 percent), whereas at the currently authorized pool elevation, severe slopes (16 percent and over) are in the majority. The gentler slopes will be less susceptible to erosive forces. Bank erosion along the Des Moines River and its tributaries can be attributed to several factors. Of primary importance would be the meandering process itself coupled with bank composition and erodibility and variations and magnitude of stream discharge. In addition, recreational activity and other land use changes can affect the rate and extent of bank erosion.

4.3.2 Water quality and quantity in both surface waters and surficial and bedrock aquifers will reflect the higher pool levels, though it is not expected to impact to any great degree. Increased dissolved solids in the Mississippian bedrock aquifer and into the hydraulically connected alluvial, aquifer, as a result of increased hydraulic head in the reservoir, will occur.

4.3.3 Sediment will continue to be supplied to the reservoir in varying amounts depending on such factors as human land use and the prevailing slopes, soil types, vegetative cover, rainfall, and stream competency. "Competency" refers to the ability of a stream to move particles of sediment of any given size. The current entrapment ratio is approximately 90 percent, with sediment yield estimated at about 6.5 million tons per year. Because the sediment accumulation is not uniform and tends to collect in the lower portion of the pool, the conservation pool will experience loss of storage volume with time, necessitating a pool raise to maintain the minimum 50,000 acre-feet of storage. There is no significant effect, however, on the flood control storage provided during the economic project life. Flood control capacity would diminish, but low-flow augmentation should benefit due to a conservation pool raise. The raise in base level of the tributary rivers and streams invariably has two impacts: aggradation and meandering. Streams are dynamic systems which are constantly adjusting in order to balance transport requirements. Therefore, it is expected that increased sedimentation in the valleys along with stream course changes will occur and the greatest impacts are likely to be on streams with the lowest gradients and longest drainage. Stable conservation pool levels will result in construction of deltas, as the velocity required to maintain sediment transport is retarded by the static pool water. Sediment will be deposited in those discrete locations and the

delta front will migrate lakeward with continual sediment supply. Major storm events could negatively impact these deltas, resulting in reworking and redeposition of sediment with transport of material to deeper portions of the lake. Exposure of mudflats related to delta construction in the vicinity of the mile-long Highway 14 bridge and some that have developed around the fringes of the lake would be inundated. A positive relationship does exist between the reservoir level and underseepage as measured by excess piezometric pressure, gradients, and changes in hydrochemistry.

4.3.4 EVALUATION OF ALTERNATIVE 2

4.3.4.1 This plan would raise the conservation pool to 742 NGVD in one step. The lake at this level on a permanent basis may make the rim more stable, diminishing effects of rim erosion, or unstable due to increased fetch and wave action on a longer shoreline. Furthermore, areas below this elevation experiencing erosion would be inundated, which is likely to mitigate the erosion as well as eliminate these areas from view. It is possible that certain areas along the rim may erode faster as a result of being in a saturated state, though specific areas have not been identified. On the other hand, shoreline slopes at this elevation are less severe than at lower elevations and, therefore, susceptibility to erosion forces should diminish.

4.3.4.2 The trap efficiency (entrapment ratio) of the reservoir at this level is probably the highest, and, given the greatest period of time at this elevation relative to other alternatives, reduction of flood storage volume is probable. Computer simulation of sedimentation indicates accumulation of sediment on the order of 316,596 acre-feet in the year 2069. This translates into remaining conservation storage of 49,357 acre-feet and 1,434,102 acre-feet of total storage. In the first 20 to 30 years, this plan will have the greatest impact, resulting in greater conservation capacity, but diminished flood control capacity. Hydraulic studies did not indicate a significant increase in either backwater effect or any downstream impacts. The conservation pool area would increase from less than 10,000 acres to approximately 20,000 acres.

4.3.4.3 The impact on underseepage is not fully assessed, but a positive relationship does exist. The ground water will likely display an increase in dissolved solids; however, water quality analyses performed for the city of Pella on their water supply have not indicated any significant degradation of water quality since reservoir closure. Ground water should remain suitable for all intended purposes.

4.3.5 EVALUATION OF ALTERNATIVE 3

4.3.5.1 This alternative is a two-phased increase in pool elevation, initially to 736 feet NGVD followed by a later raise to 742 feet NGVD and dependent on an evaluation of sedimentation. Impacts from this alternative on lake rim or bank erosion are not significantly different from the previously described alternatives.

4.3.5.2 Sedimentation under this plan is expected to be reduced due to a lower entrapment ratio. Computer simulations indicate sediment volume on the order of 314,143 acre-feet by 2069. Conservation storage at that time would be 50,963 acre-feet and total storage about 1,436,555 acre-feet. The lower trap efficiency would possibly provide some additional storage volume and thus prolong the reservoir life. The frequency of flooding of easement lands would be similar to Alternative 2.

4.3.6 EVALUATION OF ALTERNATIVE 7 (PREFERRED ALTERNATIVE) From a geotechnical standpoint, the effects of this alternative are identical to those of the first step of Alternative 3.

4.4 HYDROLOGY. The changes in flood frequency and duration in the pool area, including easement lands, resulting from a pool raise are readily apparent only at elevations at or below the proposed conservation pool level. For higher elevations, the improved discharge schedule tends to minimize frequency and duration variations from the existing condition. Downstream changes in flow frequency and duration are so minor as to not change the flow frequency relationships and only slightly change the flow duration relationships. Therefore, changes in hydrologic conditions are insignificant. Protection from flooding will not be diminished. The capacity for low-flow augmentation will increase. There will be no significant increase in turbidity or flooding caused by backwater effects from the reservoir during high pool levels.

4.4.1 EVALUATION OF NO ACTION AND ALTERNATIVE 1

4.4.1.1 Under these alternatives, three-step raises would occur. The first step would raise normal pool to 733 feet NGVD, the second step to 738 NGVD, and the third to 742 NGVD.

4.4.1.2 With no change in release rates, no changes in flood frequency or duration are anticipated.

4.4.1.3 With increased release rates, the frequency of flooding on easement lands is slightly decreased. As an example, lands at elevation 770 feet NGVD would flood every 13.3 years versus every 12.1 years under current operation conditions. The subsequent pool raises to 742 feet NGVD will have effects similar to those described in Alternatives 3 and 2, respectively.

4.4.2 EVALUATION OF ALTERNATIVE 2

4.4.2.1 Under this plan, a one-step pool raise to 742 feet NGVD would occur. This alternative would impact both the hydrology and water quality to the greatest extent. As such, the pool raise to 742 feet NGVD has been evaluated the most by Rock Island District Hydraulics Branch staff.

4.4.2.2 A normal pool elevation of 742 feet NGVD would not increase the frequency of flooding on easement lands compared to the base condition due to the changes in the release schedule. Alternative 2 does result in a slight increase in flooding elevation for a given frequency compared to

the three-step raise alternative (Alternative 4). This increase in flood elevations for given storm events is generally 0.5 foot or less in the easement area. Above elevation 778 feet NGVD, the frequency of flooding would remain the same. The duration of flooding in easement lands will not change significantly.

4.4.2.3 There will be no significant increase in downstream flooding. The duration of high flow events downstream will be increased very slightly (i.e., the increase will be less than 1 percent for a flow of 30,000 ft^3/s at Ottumwa).

4.4.3 EVALUATION OF ALTERNATIVE 3

4.4.3.1 Under this plan a two-step pool raise would occur. The first raise would be to 736 feet NGVD and the second to 742 feet NGVD.

4.4.3.2 For this alternative, the frequency of flooding on easement lands would be essentially the same as for Alternative 2 above elevation 752 feet NGVD.

4.4.4 EVALUATION OF ALTERNATIVE 4

4.4.4.1 Under this alternative, a three-step raise would occur. The first step would raise normal pool to 732 feet NGVD, the second step to 736 feet NGVD, and the third to 742 feet NGVD.

4.4.4.2 This alternative pool raise will have effects identical to those described previously for the other alternatives.

4.4.5 EVALUATION OF ALTERNATIVE 7 (PREFERRED ALTERNATIVE). Reference Section 4.4.3.2 above. The effects of this alternative are essentially the same as the effects of the first step of Alternative 3.

4.5 WATER QUALITY

4.5.1 Some changes in water quality are to be expected with a raise in pool elevation. For the most part, these changes would be due to the increase in reservoir depth and volume and the increase in the reservoir retention time. The Rock Island District has modelled projected water quality changes associated with the pool raise. Other changes can be anticipated on the basis of typical limnological characteristics and dynamics.

4.5.2 Potential water quality changes would include the following:

1. Decrease in turbidity, suspended solids and a corresponding increase in transparency is expected. This may lead to occasional algal blooms which could be of nuisance proportion.

2. Reservoir stratification is expected to be more defined and of longer duration during mid-summer; this would result in reduced water temperatures and dissolved oxygen concentrations in the deeper portions of Lake Red Rock. However, short retention times in conjunction with mixing by wind and advective flow will minimize the impact.

3. Assuming hypolimnetic discharge from Lake Red Rock, the water discharged to the Des Moines River will be cooler and lower in dissolved oxygen during the summer months (compared to present) and warmer than present during the winter.

4. There may be some increase in surface dissolved oxygen during summer periods, due to photosynthesis by phytoplankton and aquatic macrophytes; however, dissolved oxygen concentrations near the bottom could fall to very low levels at the same time.

4.5.3 No significant changes in nutrient concentrations, or the concentrations of pesticides or metals are anticipated. These parameters are essentially determined by land use within the watershed above Lake Red Rock; this is not expected to change noticeably with the pool raise. The nutrient levels in the discharge may decrease due to nutrient utilization within Lake Red Rock enhanced by the increased retention time and increased sedimentation.

4.5.4 Although not directly a water quality parameter, sedimentation does impact water quality and limnological parameters and therefore merits discussion here (see Section 4.3 for more detail). Overall, sedimentation and entrapment within Lake Red Rock will increase somewhat with the pool raise. This also will result in increased nutrient entrapment in the reservoir. The increased retention time will result in some decrease in turbidity within Lake Red Rock. While discharge may be an existing component in bed scouring and downstream bank erosion, modelling conducted by the Rock Island District has determined that there will not be a significant change.

4.5.4.1 Evaluation of Alternative 2.

4.5.4.1.1 A decrease in turbidity and suspended solids will occur due to the increased reservoir retention time. This decrease will likely be aesthetically noticeable near the dam. The depth at which a Secchi disk is observed can be expected to increase about 0.2 meter. Higher phytoplankton populations in the reservoir are expected, due both to increased retention time and decreased turbidity, and could lead to aesthetically undesirable conditions for contact recreation sports during summer months. It is anticipated that any algal blooms will be of short duration due to zooplankton population grazing.

4.5.4.1.2 Reservoir stratification will be more defined and of longer duration during the summer months. While surface temperatures are predicted to remain essentially the same after the pool raise, bottom temperatures may decrease 4° to 5°C under low-flow conditions. Periods of low dissolved oxygen concentrations will likely increase corresponding to the periods of thermal stratification. Mixing by wind, advective flow, and relatively short retention times will minimize the duration of any stratification and assure that long-term stratification will not occur.

4.5.4.1.3 Downstream water quality will be cooler and lower in dissolved oxygen during the summer months, reflective of the near bottom conditions of the reservoir. Aeration of discharge water through the outlet works, along with the short duration of low dissolved oxygen periods, should keep water quality from impacting any downstream aquatic communities or other uses.

4.5.4.2 Evaluation of Alternative 3. At normal pool of 736 feet NGVD, the impacts to water quality would be as discussed in Alternative 2 but to a lesser degree in each case. The main advantage to the two-step raise would be to assess the predicted impacts to phytoplankton populations and to the stratification of the reservoir.

4.5.4.3 Evaluation of Alternative 4. At a normal pool elevation of 732 feet NGVD, the impacts of water quality would be as discussed in Alternative 2 but to a lesser degree in each case. The subsequent pool raises to 736 feet NGVD and finally to 742 feet NGVD will have effects similar to those described in Alternatives 3 and 2, respectively.

4.5.4.4 Evaluation of Alternative 7 (Preferred Alternative). At a normal pool elevation of 734 feet NGVD, the impacts on water quality would be as discussed in alternative 3, but to a lesser extent.

4.6 SOCIO-ECONOMIC EFFECTS

4.6.1 EMPLOYMENT AND COMMUNITY GROWTH

4.6.1.1 The proposed alternatives would not significantly affect the permanent employment or labor force of the Marion County area, as the alternatives would involve a small number of construction workers relocating recreation facilities.

4.6.1.2 With each of the alternatives, the pool elevation would be raised, increasing the attractiveness of Lake Red Rock to recreationists. This increased potential for recreation visitors at the lake could attract new businesses to the area and create new employment opportunities. While the number of visitors to the Lake may increase with each of the five alternatives, it would likely increase more quickly with a one-step raise in the pool elevation to 742 feet NGVD.

4.6.2 REGIONAL GROWTH. No effect on regional growth is anticipated as a result of any of the alternatives to raise the pool. It should be noted that by raising the pool elevation any one of the five acceptable alternatives would help to ensure that the attractiveness of Lake Red Rock tourism sites and the lake itself will remain great enough to maintain the current level of tourism at the Red Rock area.

4.6.3 COMMUNITY COHESION. Land surrounding Lake Red Rock is primarily undeveloped or used for agricultural purposes. No effect on community cohesion is expected due the limited residential development in the project vicinity. Many farmers favor a minimum pool raise because they perceive an increased risk of flooding due to higher pool elevations.

4.6.4 DISPLACEMENT OF PEOPLE. No relocations would be required with the pool raise alternatives.

4.6.5 PROPERTY VALUES. Higher lake levels may increase values of residential or vacation "lake homes"; however, agricultural properties may be adversely affected. Impacts appear minimal with each of the various pool raise alternatives.

4.6.6 TAX REVENUES. Any pool raise alternative would have negligible effects on the tax base for downstream properties. However, the various alternatives for raising the pool would have similar impacts on pool area property tax revenues. Without a raise in the pool elevation, a small decrease in boat ownership and purchases might result as the pool becomes more filled with sediment. Tax revenues would decline slightly as a result of decreased sales tax and boat license fee revenues. The proposed alternatives would prevent this loss in tax revenues.

4.6.7 PUBLIC FACILITIES AND SERVICES

4.6.7.1 Raising the pool level at Lake Red Rock would enhance users' recreational experiences by improving aesthetics, boating, fishing, and wildlife habitat. Each of the pool raise alternatives would help to fulfill part of the recreational needs of south-central Iowa.

4.6.7.2 Recreation at various facilities would be temporarily disrupted during the construction phase of each alternative when the facilities would be relocated to higher elevation areas. A fast pool raise would more quickly provide the maximum enhancement of the pool for recreation purposes.

4.6.8 BUSINESS AND INDUSTRIAL ACTIVITIES. With each alternative, changes in business and industrial activity during construction would be minimal. As the pool level is raised and the potential for tourism increases, land in the vicinity of Lake Red Rock might become more attractive for commercial development. ~~No businesses would be displaced as a result of the project.~~

4.6.9 FARM DISPLACEMENT. No farms would be displaced by any of the alternatives. Approximately 29,000 acres of land in the pool are currently in crop production. Following a raise in pool elevation, this land would have a minor increase in flooding probabilities.

4.6.10 NOISE LEVELS

4.6.10.1 With each of the pool raise alternatives, construction machinery associated with facility relocation would generate a temporary increase in noise during construction. This increase might disturb recreationists at Lake Red Rock. However, no sensitive receptors (e.g., hospitals or schools) are located near the recreation sites that would require relocation, and, therefore, no significant impacts would be expected.

4.6.10.2 No relocations would be immediately required by No Action or Alternatives 1, 3, 4, and 7; however, relocation of North Overlook Beach, Whitebreast Beach, and Whitebreast boat ramp is expected to occur with or without elevation of the conservation pool. Machinery associated with this type of activity would be trucks, bulldozers, endloaders, paving equipment, cement mixers, and a crane with dragline. Noise elevations would be isolated and temporary.

4.6.10.3 Elevation of the pool by larger steps, such as 736 or 742 feet NGVD, may significantly increase power boat use at the reservoir, thereby increasing noise levels. The resulting size of the lake, however, should allow dispersal of powered craft throughout the entire lake surface. This may serve to limit concentrations of powercraft in the lower lake and subsequent aesthetic/noise conflicts with sailboaters and sightseers.

4.6.11 LAND USE

4.6.11.1 Upstream Land. Land use within the entire reservoir pool has stabilized since the initial stages of development due to the conditions previously described. Reservoir land management results from joint coordination between the Corps of Engineers, the State, and Marion County. Lake level increases may alter existing reservoir land use and management programs by the reduction of land area, in varying degrees. The land use from 728 to 742 feet NGVD is principally comprised of an estimated 24 percent agricultural lands, 75 percent forb and brush coverage, with the remaining 1 percent in man-dominated developed lands. No impacts to land use outside the reservoir are anticipated.

4.6.11.2 Downstream Land. The downstream land use will not be affected by an increase of released flowage from a raise in the lake level. Refer to appendix A of the Water Control Plan for detailed discussion of regulation of dam releases.

4.6.11.3 Flowage Easement Land. Flowage easement lands are generally between the 760 and 783 feet NGVD elevations. Between 760 and 765 feet NGVD, a greater inundation frequency, with lesser duration, may result from increases in normal lake levels to elevation 742 feet NGVD. Within the easement lands there are an estimated 16,368 acres of agricultural lands, 3,750 acres of bottomland forest, with the remaining in sparse covered forest and grasslands. Changes of use and development are predicted to be negligible due to the existing legal controls and limitations on easement lands.

4.6.12 TRANSPORTATION. A raise in conservation pool level is not predicted to have impacts to the State highway system within the reservoir area. Low-lying county roads which currently are subject to periodic inundation are anticipated to incur similar effects under conservation pool raises. About 900 acres of agricultural lease land will be taken out of cropping due to lack of access resulting from road inundation at elevation 742 feet NGVD.

4.6.13 RECREATIONAL ELEMENTS. The land-based activities and facilities within each recreation area, including camping, picnicking, and trail systems, are above the 760-foot elevation and are in good condition to meet demands of use. They should experience no impacts from a change in the reservoir regulation plan. It is anticipated that an increase in recreational usage may occur as a result of improved boating and fishing. This may, in turn, increase usage of picnic and camping areas. However, most of the recreational facilities are presently under-utilized. The water-based facilities within the reservoir (boat ramps and swimming areas) are in various conditions as described. All will be affected by the change in regulation alternatives. Boating activities on the reservoir are curtailed by existing under-water hazards of embankments, existing tree stumps and sedimentation buildup. In 1977, the reported pool acreage of 11,710 acres at elevation 728 feet NGVD provided a safe-boating acreage of approximately 6,100 acres (52 percent), compared to what is now available.

4.6.13.1 The Marion County Conservation Board operates Roberts Creek Lake, an impoundment formed by a highway embankment along the north rim of Lake Red Rock. Roberts Creek Lake has a spillway elevation of 750 feet NGVD; therefore, any flood event resulting in pool elevations of 750 or higher, backs the main lake into Roberts Creek Lake. Up to 19,000 acre-feet of flood storage is available in the Roberts Creek embayment. It is anticipated that no significant change in flood effects will occur in the Roberts Creek embayment as a result of the proposed pool raise. With no significant change in flood effects, no significant effects will be realized for natural and cultural resources, as well as recreational use.

4.6.13.2 Evaluation of No Action and Alternative 1. These plans would involve a three-phased change on the conservation pool with the first step raise to 733 feet NGVD, a later step raise to 738 feet NGVD, and a final step to 742 feet NGVD.

4.6.13.2.1 Evaluation of Land-Based Recreational Elements--Land-based activities and facilities will be positively affected by the phased pool raises.

4.6.13.2.2 Evaluation of Water-Based Recreational Elements--Water-based activities of boating will be slightly improved by the three-phased pool raise.

4.6.13.2.2.1 The existing sedimentation and mudflats would be variably inundated and may cause the additional boating hazard of shallow waters in the first step. The first step raise to 733 feet NGVD would improve serviceability to all existing boat ramps including the currently unserviceable ramps of Lakeview (Whitebreast), Whitebreast Bay, Elk Rock South, and Elk Rock North. The second step raise to 738 feet NGVD will have similar effects as delineated in Alternative 3.

4.6.13.2.2.2 Whitebreast Beach and North Overlook Beach will not be affected appreciably by the first step raise to 733 feet NGVD. The North Overlook Beach will have approximately 550 lineal feet of shoreline at a width of 100 feet.

4.6.13.2.2.3 The subsequent raises to 738 and 742 feet NGVD will have similar effects as delineated in Alternative 3. Immediate effects of the first step raise will inundate many of the mudflats and will provide some aesthetic improvement. The second-step and the final-step raises will be similar to Alternative 3.

4.6.13.3 Evaluation of Alternative 2. This plan would raise the conservation pool to elevation 742 feet NGVD in one step.

4.6.13.3.1 Evaluation of Land-Based Recreational Elements--Land-based activities and facilities will be positively affected by the raised pool elevation. The lake is an aesthetic attraction and any improvement, i.e., mudflat coverage, may positively affect land-based recreation.

4.6.13.3.2 Evaluation of Water-Based Recreational Elements--The water-based activities and boating would be greatly enhanced by the increase of safeboating acreage to the reservoir.

4.6.13.3.2.1 Current under-water hazards of sediment accretions and tree hazards would, for the most part, be negated. Some boat ramp landing areas would require upgrading for the 742-foot elevation, except for South Overlook, Red Rock Marina, and South Elk Rock. The existing boat ramps at Lakeview (Whitebreast), Whitebreast Bay, North Elk Rock, and Elk Rock South are currently classified as unserviceable due to shallow waters and siltation. These boat ramps would become serviceable with modification for the 742 feet NGVD elevation.

4.6.13.3.2.2 Whitebreast Beach would be completely inundated and will require major modification. The North Overlook Beach also would require up-slope relocation to accommodate the 742 feet NGVD elevation.

4.6.13.3.2.3 The current mudflats will be inundated by the raised pool level which will greatly improve the reservoir aesthetics around the Highway 14 bridge; a highly visible vantage point. In this area, several hundred additional acres of water surface may be considered boatable from the standpoint of safety.

4.6.13.4 Evaluation of Alternative 3. This plan would be a two-phased change in the conservation pool with the first step pool raise to 736 feet NGVD and a later pool raise to 742 feet NGVD.

4.6.13.4.1 Evaluation of Land-Based Recreational Elements--Land-based activities and facilities would be positively affected by the phased pool raises.

4.6.13.4.2 Evaluation of Water-Based Recreational Elements--Water-based activities of boating would be improved by the pool raise to 736 feet NGVD and eventually to 742 feet NGVD. The existing sedimentation and mudflats would be inundated in the first step which may cause additional boating hazards in shallow water, particularly in the vicinity above the Highway 14 bridge. The final step raise would provide the additional depth for safe boating until sedimentation reclaims the upper reservoir.

4.6.13.4.2.1 In the first-step raise to 736 feet NGVD, some of the boat ramps would become usable and would require no modification. Some boat ramps may require modification for the 742 feet NGVD elevation. There are three exceptions which will not be affected by the phased pool raise: (1) the boat ramp at South Overlook, (2) Red Rock Marina, and (3) South Elk Rock. All boat ramps are at an optimum use at a pool elevation of 736 feet NGVD, except Lakeview Landing. The boat ramps at Lakeview (Whitebreast), Whitebreast Heights, Whitebreast Bay, North Elk Rock and Elk Rock South are currently classified as unserviceable due to shallow waters and siltation.

4.6.13.4.2.2 At North Overlook Beach, the first step raise to 736 feet NGVD would provide a 500-lineal-foot shoreline with sand beach to elevation 744 feet NGVD. The raise to 742 feet NGVD would require modification by relocation or improvement prior to the final step raise.

4.6.13.4.2.3 At the Whitebreast Beach, the first step raise to 736 feet NGVD would essentially inundate the beach area and access road, thereby requiring the modification by relocation.

4.6.13.4.2.4 Immediate effects of the first step raise would inundate many of the current mudflats, providing a greater aesthetic appearance, including the area around Highway 14 bridge, with the final step raise effects being similar to Alternative 2.

4.6.13.5 Evaluation of Alternative 4. This plan would be a three-phased change on the conservation pool with the first step raise to 732 feet NGVD, with a later step raise to 736 feet NGVD, and the final step to 742 feet NGVD.

4.6.13.5.1 Evaluation of Land-Based Recreational Elements--Land-based activities and facilities will be positively affected by the phased pool raises.

4.6.13.5.2 Evaluation of Water-Based Recreational Elements--Water-based activities of boating will be improved by the phased pool raise.

4.6.13.5.2.1 The existing sedimentation and mudflats will be variably inundated and may cause the additional boating hazard of shallow waters in the first step. The first step raise to 732 feet NGVD will provide serviceability to all existing boat ramps including the currently unserviceable ramps of Lakeview (Whitebreast), Whitebreast Bay, Elk Rock South, and Elk Rock North. The second step raise to 736 feet NGVD will have similar effects as delineated in Alternative 3.

4.6.13.5.2.2 Whitebreast Beach and North Overlook Beach will not be affected appreciably by the first step raise to 732 feet NGVD. The North Overlook Beach will have approximately 550 lineal feet of shoreline at a width of 100 feet.

4.6.13.5.2.3 The second step raise to 736 and 742 feet NGVD will have similar effects as delineated in Alternative 3. Immediate effects of the first step raise will inundate many of the mudflats and will provide some aesthetic improvement. The second-step and the final-step raises will be similar to Alternative 3.

4.6.13.6 Evaluation of Alternative 7 (Preferred Alternative). Effects of this plan are similar to Alternative 3, except that only one raise to 734 feet NGVD will occur instead of 736 feet NGVD with no subsequent raise to elevation 742.

4.6.13.6.1 Evaluation of Land-Based Recreational Elements--Land-based recreation is tied into lake levels from the aspects of aesthetics and sightseeing. Also, a significant number of campers and hikers are also boaters and fishermen. Pool raises will not remove any currently significant terrestrial recreational areas from public use.

4.6.13.6.2 Evaluation of Water-Based Recreational Elements--With essentially the same effects as described in 4.6.13.4.2, preceding, this alternative does not provide as much boating water and presents somewhat riskier boating in the area near the Highway 14 bridge.

4.7 CULTURAL RESOURCES

4.7.1 The cultural resources sites within Lake Red Rock may be impacted by several factors as a result of a pool raise (table EIS-15). This includes physical inundation as the pool rises, as well as erosion by wave action (beach cuts) and sedimentation. Extant archeological sites represent 7,000 years of prehistory and history, beginning with the Early Archaic period and culminating in the middle of the twentieth century. Of the 420 sites, it has been determined that 11 are eligible for the National Register of Historic Places (NRHP) based upon their demonstrated ability to yield data of importance to the history and prehistory of the region.

4.7.2 Six of the 420 sites are shown as inundated by Lake Red Rock at its fall elevation of 730 feet. Normal operation of the lake for flood control purposes had frequently necessitated filling the lake to elevations of greater than 748 feet. As a result, lands along the shoreline from elevations of 728 feet to 748 feet are severely eroded, a process which is

TABLE EIS-15

Projected Impacts to Archaeological Sites
Lake Red Rock Pool Raise Project

Site	742 ft One Step	734 ft One Step	732 ft, 736 ft, 742 ft Three Step	742 ft, 760 ft Erosion/Flood Cycles
MA 1	No impact	—	—	—
MA 2	No impact	—	—	—
MA 3	On shoreline at 744'; subjected to erosion	No impact	No impact	Inundated at 750'; bank erosion and siltation
MA 4	No impact	—	—	—
MA 7	Inundated at present	—	—	—
MA 9	No impact	—	—	Partially inundated at 760'; some erosion
MA 11	No impact	—	—	—
MA 15	No impact	—	—	—
MA 16	No impact	—	—	—
MA 18	No impact	—	—	—
MA 24	No impact	—	—	—
MA 25	No impact	—	—	—
MA 27	No impact	—	—	—
MA 28	No impact	—	—	—
MA 29	No impact	—	—	—
MA 32	Inundated at 744'; subjected to siltation	No impact	No impact	Inundated; siltation
MA 33	No impact	—	—	—
MA 34	No impact	—	—	—
MA 35	No further impact	—	—	—
MA 36	No impact	—	—	—
MA 37	No impact	—	—	—
MA 38	No impact	—	—	—
MA 40	No impact	—	—	—
MA 42	On shoreline at 744'	No impact	No impact	Inundated at 750'; siltation and some erosion
MA 43	No impact	—	—	—
MA 44	Increased sheet erosion	No impact	No impact	On shoreline at 760'; subjected to wave action and erosion
MA 45	No impact	—	—	—
MA 47	Inundated at present	—	—	—
MA 52	No impact	—	—	—
MA 55	No impact	—	—	—
MA 80	No impact	—	—	—
MA 81	No impact	—	—	—
MA 84	On shoreline at 742'; subjected to bank erosion	No impact	No impact	Inundated at 745'; erosion, siltation
MA 86	No impact	—	—	—
MA 87	No impact	—	—	—
MA 89	No impact	—	—	—
MA 91	No impact	—	—	—
MA 92	No impact	—	—	—
MA 93	No impact	—	—	—
MA 101	No impact	—	—	—
MA 102	No impact	—	—	—
MA 103	Inundated at present	—	—	—
MA 104	No impact	—	—	—
MA 105	No impact	—	—	—
MA 106	Inundated at present	—	—	—
MA 107	No impact	—	—	—
MA 108	No impact	—	—	—
MA 109	No impact	—	—	—
MA 110	No impact	—	—	—
MA 111	No impact	—	—	—
MA 114	No impact	—	—	—
MA 115	No impact	—	—	Partially inundated at 760'; subjected to wave action, erosion
MA 116	No impact	—	—	—
MA 117	No impact	—	—	—
MA 118	No impact	—	—	—
MA 119	Over half inundated at 742'; subjected to wave action and erosion	Partially inundated at 736'; wave action	Partially inundated at 732'; wave action	Mostly inundated at 760', wave action and erosion
MA 122	Inundated at 742'; subjected to erosion	Mostly inundated at 736'; subjected to wave action	Mostly inundated at 732'; wave action	Inundated
MA 123	Mostly inundated at 742';	Partially inundated at 736'	On shoreline at 732';	Inundated at 750'

TABLE EIS-15 (Cont'd)

Site	742 ft One Step	734 ft One Step	732 ft, 736 ft, 742 ft Three Step	742 ft, 760 ft Erosion/Flood Cycles
MA 126	Mostly inundated at 742';	Partially inundated at 736'	On shoreline at 732';	Inundated at 750'
MA 127	On shoreline at 742'-744'	No impact	No impact	Inundated at 750'
MA 128	(Partially inundated at 742' Site ranges from 730'-755')	Partially inundated at 736'	On shoreline at 732'; Partially inundated at 734'	Inundated at 760'
MA 129	Mostly inundated at 742';	Mostly inundated at 736';	Mostly inundated at 732'	Inundated at 750'
MA 130	No impact	—	—	Partially inundated at 760'
MA 131	No impact	—	—	On shoreline at 760'
MA 132	No impact	—	—	—
MA 133	No impact	—	—	On shoreline at 760'
MA 134	Mostly inundated at 742'; erosion	Mostly inundated at 736';	Mostly inundated at 732' (partially inundated at 728')	Inundated at 750'
MA 135	No impact	—	—	Partially inundated at 760'; subjected to wave action, erosion
MA 136	(Site mostly at 750'-780') Partially inundated at 742'	Partially inundated at 736'	On shoreline at 732';	Partially inundated at 760'; subjected to wave action, erosion
MA 137	No impact	—	—	—
MA 138	No impact	—	—	—
MA 139	No impact	—	—	—
MA 140	No impact	—	—	—
MA 141	No impact	—	—	—
MA 142	No impact	—	—	—
MA 143	No impact	—	—	—
MA 144	No impact	—	—	—
MA 145	No impact	—	—	—
MA 146	No impact	—	—	—
MA 147	No impact	—	—	—
MA 148	No impact	—	—	—
MA 149	No impact	—	—	—
MA 150	No impact	—	—	—
MA 152	No impact	—	—	—
MA 153	No impact	—	—	On shoreline at 760'
MA 154	No impact	—	—	Mostly inundated at 760'; subjected to erosion
MA 155	No impact	—	—	On shoreline at 760'
MA 156	No impact	—	—	—
MA 157	No impact	—	—	—
MA 158	No impact	—	—	—
MA 159	No impact	—	—	—
MA 160	No impact	—	—	—
MA 161	No impact	—	—	—
MA 162	Inundated at 742'; subjected to wave action	Mostly inundated at 736';	Partially inundated at 732'	Inundated
MA 163	Inundated at 742'; subjected to wave action	Mostly inundated at 736';	Partially inundated at 732'	Inundated
MA 164	Inundated at 742'; subjected to wave action	Mostly inundated at 736';	Partially inundated at 732'	Inundated
MA 165	Inundated at 742'; subjected to wave action	Mostly inundated at 736';	Partially inundated at 732'	Inundated
MA 166	No impact	—	—	—
MA 167	Inundated at 742';	Partially inundated at 736'	On shoreline at 732'	Inundated
MA 203	Inundated at 742';	Inundated at 736'	Partially inundated at 732'	Inundated
MA 204	Mostly inundated at 742';	Mostly inundated at 736';	Partially inundated at 732'	Inundated at 750'; subjected to erosion
MA 205	No impact	—	—	—
MA 206	No impact	—	—	Inundated at 750'; siltation
MA 209	No impact	—	—	Inundated at 760'; siltation, erosion
MA 210	Partially inundated at 742'; subjected to siltation	No impact	No impact	Inundated at 760'; siltation, erosion
MA 211	No impact	—	—	—
MA 212	No impact	—	—	Inundated at 760'; siltation, erosion
MA 213	No impact	—	—	Inundated at 760'; siltation
MA 214	No impact	—	—	—
MA 215	No impact	—	—	—

TABLE EIS-15 (Cont'd)

Site	742 ft One Step	734 ft One Step	732 ft, 736 ft, 742 ft Three Step	742 ft, 760 ft Erosion/Flood Cycles
MA 216	On shoreline at 742'; Inundated at 744'; subjected to siltation	No impact	No impact	Inundated at 744'; siltation
MA 217	No impact	—	—	Inundated at 755'; siltation
MA 218	On shoreline at 742';	Partially on shoreline at 736';	No impact	Inundated at 755'; subjected to wave action, erosion
MA 219	No impact	—	—	Partially inundated at 760'; subjected to wave action, erosion
MA 220	On shoreline at 744'; no impact at 742';	No impact	No impact	Inundated at 760'; subjected to erosion
MA 223	On shoreline at 744 ft No impact at 742'; subjected to siltation and some erosion	No impact	No impact	Inundated at 745'; siltation
MA 224	No impact	—	—	Inundated at 750'; siltation
MA 225	No impact	—	—	Inundated at 760'; siltation
MA 226	No impact	—	—	Inundated at 760'; erosion
MA 229	No impact	—	—	—
MA 230	No impact	—	—	—
MA 232	No impact	—	—	—
MA 234	No impact	—	—	—
MA 235	No impact	—	—	—
MA 236	No impact	—	—	—
MA 237	No impact	—	—	—
MA 238	No impact	—	—	—
MA 239	No impact	—	—	—
MA 240	No impact	—	—	On shoreline at 760'
MA 243	No impact	—	—	—
MA 244	No impact	—	—	—
MA 245	No impact	—	—	On shoreline at 760'
MA 246	No impact	—	—	Inundated at 760'
MA 247	No impact	—	—	Inundated at 760'
MA 249	No impact	—	—	Inundated at 760'
MA 251	No impact	—	—	On shoreline at 760'
MA 252	No impact	—	—	Inundated at 760'; siltation
MA 256	No impact	—	—	—
MA 257	No impact	—	—	On shoreline at 760'
MA 260	No impact	—	—	—
MA 262	Inundated at 742'; subjected to siltation	No impact at 736';	No impact at 732';	Inundated at 745'
MA 263	Inundated at 742'; subjected to siltation	No impact at 736';	No impact at 732';	Inundated at 745'
MA 264	Inundated at 742'; subjected to siltation	No impact at 736'	No impact at 732';	Inundated at 745'
MA 265	Inundated at 742'; subjected to siltation	No impact at 736'	No impact at 732';	Inundated at 745'
MA 266	No impact	—	—	Inundated at 750'
MA 267	No impact	—	—	—
MA 268	No impact	—	—	On shoreline at 760'
MA 270	No impact	—	—	—
MA 271	No impact	—	—	—
MA 272	No impact	—	—	—
MA 273	No impact	—	—	Inundated at 760'
MA 274	On shoreline at 744'; no impact at 742';	No impact	—	Inundated at 750'
MA 275	No impact	—	—	—
MA 276	No impact	—	—	—
MA 277	No impact	—	—	—
~~MA 278~~	~~No impact~~	—	—	—
MA 279	No impact	—	—	Inundated at 760'
MA 280	No impact	—	—	—
MA 281	Inundated at 742'; subjected to wave action	Partially inundated at 736'	Partially inundated at 732'	Inundated
MA 282	Mostly inundated at 742' and 744'	Partially inundated at 736' and 738'	Partially inundated at 732'	Inundated at 750'; erosion
MA 283	Mostly inundated at 742'; subjected to wave action	Partially inundated at 736'	Partially inundated at 732'	Inundated
MA 284	Inundated at 742'; subjected to wave action	Mostly inundated at 736'	Partially inundated at 732'	Inundated
MA 285	No impact	—	—	Partially inundated at 760'

TABLE EIS-15 (Cont'd)

Site	742 ft One Step	734 ft One Step	732 ft, 736 ft, 742 ft Three Step	742 ft, 760 ft Erosion/Flood Cycles
HA 286	Inundated at 742'; subjected to wave action	Mostly inundated at 736'	Mostly inundated at 732'	Inundated
HA 287	Inundated at 742'	Mostly inundated at 736'	Mostly inundated at 736'	Inundated
HA 288	Mostly inundated at 742'	On shoreline at 736'	No impact at 732'	Inundated
HA 290	No impact	—	—	—
HA 291	No impact	—	—	—
HA 292	No impact	—	—	On shoreline at 760'; subjected to erosion
HA 293	No impact	—	—	On shoreline at 760'; subjected to erosion
HA 294	Mostly inundated at 742'	Partially inundated at 736'	Partially inundated at 736'	Inundated at 760'
HA 295	Inundated-probable siltation	Inundated just below shoreline	Mostly inundated at 732'	Inundated
HA 296	Partially inundated at 742'	Partially inundated at 736'	On shoreline at 735'	Inundated at 750'
HA 297	No impact	—	—	On shoreline at 760'
HA 298	On shoreline at 742'	No impact	No impact	Inundated at 745'
HA 299	On shoreline at 742'	No impact	No impact	Inundated at 745'
HA 303	No impact	—	—	On shoreline at 760'
HA 304	No impact	—	—	—
HA 317	Inundated at 742'; siltation	Inundated at 740'; subjected to some erosion and siltation	Inundated at 740'; subjected to some erosion and siltation	Inundated; siltation
HA 320	No impact	—	—	Inundated at 755'
HA 323	No impact	—	—	Inundated at 755'
HA 324	No impact	—	—	Inundated at 750'
HA 328	No impact	—	—	Inundated at 760'; erosion, siltation
HA 332	No impact	—	—	Partially inundated at 760'
HA 346	No impact	—	—	On shoreline at 760'
HA 350	No impact	—	—	Inundated at 750'; siltation
HA 351	No impact	—	—	Inundated at 750'; siltation
HA 356	On shoreline at 744'	No impact	No impact	Inundated at 750'
HA 359	Inundated just below shoreline	Mostly inundated at 736'	Partially inundated at 732'	Inundated
HA 360	No impact	—	—	Inundated at 760'
HA 361	Inundated at 744'	Inundated at 736'	Mostly inundated at 732'	Inundated
HA 362	No impact	—	—	On shoreline at 760'
HA 366	On shoreline at 744'	No impact	No impact	Inundated at 750'
HA 367	On shoreline at 744'	No impact	No impact	Inundated at 755'
HA 368	No impact	—	—	Inundated at 760'
HA 369	No impact	—	—	Inundated at 760'
HA 370	No impact	—	—	Partially inundated at 760'
HA 372	Inundated at 742'; subjected to wave action	On shoreline at 736'	No impact at 732'	Inundated
HA 373	Inundated at 742'; just below shoreline	Mostly inundated at 736'	On shoreline at 732' and 734'	Inundated
HA 381	No impact	—	—	Partially inundated at 760'
HA 382	Mostly inundated at 742'	Partially inundated at 736'	On shoreline at 732' and 734'	Inundated at 760'
HA 383	No impact	—	—	On shoreline at 760'
HA 384	Mostly inundated at 742'	Partially inundated at 736'	Partially inundated at 732'	Inundated at 760'
HA 385	No impact	—	—	Inundated at 760'
HA 386	On shoreline at 742'	No impact at 736'	No impact at 732 ft	Inundated at 760'
HA 387	On shoreline at 742'	No immediate effect at 736'	No impact	Partially inundated at 760'
HA 388	No impact	—	—	Inundated at 760'
HA 389	Partially inundated at 742'	On shoreline at 736'	No immediate impact at 732'	Inundated at 750'
HA 390	No impact	—	—	On shoreline at 760'
HA 391	No impact.	—	—	—
HA 392	~~Site will not be severely~~ impacted due to its large size but will be partially inundated at 742'	Partially on shoreline at 736'	Partially on shoreline at 732'	Partially inundated at 760'
HA 393	No impact	—	—	Inundated at 760'
HA 394	Well inundated at 742'; subjected to some erosion and siltation	Inundated at 736'	Inundated at 732 ft (severe wave action)	Inundated
HA 395	Inundated; subjected to erosion, siltation	Inundated at 736'; subjected to wave action	Partially inundated at 732'	Inundated
HA 396	Inundated at present	—	—	—
HA 397	Inundated, subjected to some erosion	Inundated at 736'; subjected to severe wave action	Mostly inundated at 732'	Inundated

TABLE EIS-15 (Cont'd)

Site	742 ft One Step	734 ft One Step	732 ft, 736 ft, 742 ft Three Step	742 ft, 760 ft Erosion/Flood Cycles
MA 398	No impact	—	—	Inundated at 760'
MA 399	No impact	—	—	Inundated at 760'
MA 400	Mostly inundated at 742'	Partially inundated at 736'	Partially inundated at 732'	Inundated at 750'; erosion
MA 401	No impact	—	—	—
MA 403	Inundated at 742'; subjected to siltation	Inundated at 736'	Mostly inundated at 732'	Inundated
MA 404	Mostly inundated at 742'; subjected to bank slump and erosion	Mostly inundated at 736';	Partially inundated at 732'	Inundated at 755'
MA 405	Inundated, just below shoreline	Mostly inundated at 736'	Partially inundated at 732'	Inundated
MA 406/13	Inundated; subjected to siltation/erosion	Inundated at 736'; just below shoreline	Mostly inundated at 732'	Inundated
MA 407	Mostly inundated at 742'	Partially inundated at 736'	On shoreline at 732'	Inundated at 745'
MA 408	On shoreline at 744'	No impact	No impact	Inundated at 755'
MA 409	No impact	—	—	—
MA 410	No impact	—	—	Mostly inundated at 760'
MA 411	Partially inundated at 742'	On shoreline at 736'	On shoreline at 736'	Inundated at 760'
MA 412	No impact	—	—	Inundated at 760'
MA 413	Inundated at 742'	Partially inundated at 736'	On shoreline at 732'	Inundated
MA 414	No impact	—	—	Partially inundated at 760'; erosion
MA 420	Mostly inundated at 742' and 744'	Mostly inundated at 736'	Partially inundated at 732'	Inundated at 750'
MA 421	Partially inundated at 742'	No impact at 736'	No impact at 732'	Inundated at 760'; wave action
MA 422	Inundated at 742'; subjected to wave action	Mostly inundated at 736'	Mostly inundated at 732'	Inundated
MA 423	Partially inundated at 742'	Partially inundated at 736'	On shoreline at 732'	Mostly inundated at 760'; erosion
MA 424	Partially inundated at 742'	Partially inundated at 742'	Partially inundated at 742'	Inundated at 760'; erosion
MA 425	Inundated at present			
MA 426	Partially inundated at 742'	Partially inundated at 736'	On shoreline at 732'	Inundated at 760'; erosion
MA 427	Partially inundated at 742'	Partially inundated at 736'	On shoreline at 732'	Mostly inundated at 760'; erosion
MA 428	Mostly inundated at 742'	Partially inundated at 736'	Partially inundated at 732'	Inundated at 750'; erosion
MA 429	Mostly inundated at 742'	Partially inundated at 736'	Partially inundated at 728'; Partially inundated at 732'	Inundated at 750'; erosion
MA 431	Partially inundated at 742'; mostly inundated at 744'	On shoreline at 736' and 738'	No impact at 732'; possible wave action at 734'	Inundated at 750'
MA 432	Mostly inundated at 742'	Partially inundated at 736'	Partially inundated at 732'	Inundated at 750'
MA 433	Partially inundated at 742' and 744'; site mostly at 750'	On shoreline at 736'	On shoreline at 732 ft	Mostly inundated at 760'
MA 434	Inundated at 742'	Inundated at 736'	Partially inundated at 732'; subjected to wave action	Inundated
MA 435	No impact at 742'; on shoreline at 744'	No impact	No impact	Inundated at 760'
MA 436	Partially inundated at 742'	On shoreline at 736'	On shoreline at 732'	Inundated at 760'
MA 437	No impact	—	—	On shoreline at 760'
MA 438	Partially inundated at 742'	Partially inundated at 736'	Partially inundated at 732'	Mostly inundated at 760'
MA 439	Inundated at 742'; wave action	Mostly inundated at 736'	Mostly inundated at 732'	Inundated
MA 440	No impact	—	—	On shoreline at 760'
MA 441	No impact	—	—	—
MA 442	No impact	—	—	Inundated at 760'
MA 443	No impact	—	—	Mostly inundated at 760'
MA 444	Mostly inundated; severe erosion	Mostly inundated at 736'; wave action	Partially inundated at 732'; wave action	Inundated
MA 445	No impact	—	—	Inundated at 760'
MA 446	No impact	—	—	Inundated at 760'
MA 447	No impact	—	—	—
MA 451	No impact	—	—	Inundated at 760'; siltation
MA 454	No impact	—	—	Inundated at 750'; siltation

TABLE EIS-15 (Cont'd)

Site	742 ft One Step	734 ft One Step	732 ft, 734 ft, 742 ft Three Step	742 ft, 760 ft Erosion/Flood Cycles
PK 1	No impact	—	—	—
PK 4	No impact	—	—	—
PK 6	No impact	—	—	—
PK 7	No impact	—	—	—
PK 8	No impact	—	—	—
PK 9	No impact	—	—	—
PK 10	No impact	—	—	—
PK 11	No impact	—	—	—
PK 12	No impact	—	—	—
PK 13	No impact	—	—	—
PK 14	No impact	—	—	—
PK 15	No impact	—	—	—
PK 33	No impact	—	—	—
PK 33A	No impact	—	—	—
PK 43	No impact	—	—	—
PK 44	No impact	—	—	—
PK 45	No impact	—	—	—
PK 46	No impact	—	—	—
PK 47	No impact	—	—	—
PK 48	No impact	—	—	—
PK 52	No impact	—	—	—
PK 55	No impact	—	—	—
PK 58	No impact	—	—	—
PK 101	No impact	—	—	—
PK 101A	No impact	—	—	—
PK 102	No impact	—	—	—
PK 103	No impact	—	—	—
PK 104	No impact	—	—	—
PK 105	No impact	—	—	—
PK 106	No impact	—	—	—
PK 290	No impact	—	—	—
PK 291	No impact	—	—	—
PK 292	No impact	—	—	—
PK 293	No impact	—	—	—
PK 294	No impact	—	—	—
PK 303	No impact	—	—	—
PK 304	No impact	—	—	—
PK 438	No impact	—	—	—
PK 439	No impact	—	—	—
PK 440	No impact	—	—	—
WA 2	No impact	—	—	—
WA 3	No impact	—	—	—
WA 5	No impact	—	—	—
WA 6	No impact	—	—	—
WA 7	No impact	—	—	—
WA 11	No impact	—	—	—
WA 26	No impact	—	—	On shoreline at 760'
WA 101	No impact	—	—	—
WA 102	No impact	—	—	—
WA 103	No impact	—	—	Inundated at 760'; siltation
WA 104	No impact	—	—	Inundated at 750'; siltation
WA 105	No impact	—	—	—
WA 106	No impact	—	—	—
WA 107	No impact	—	—	—
WA 108	No impact	—	—	—
WA 109	No impact	—	—	—
WA 110	No impact	—	—	—

— = No impact.

Source: Americn Resources Group, 1986.

ongoing. Field visits to numerous sites within this elevation range has shown that these cultural resources have already been severely impacted. Lesser impacts occasionally occur up to the maximum flood control pool elevation of 780 feet. Based upon field visits with the Iowa State Historic Preservation Officer (SHPO), it has been agreed that no further work is warranted for these disturbed sites. Any mitigation work will be limited to those sites where preservation is good and where National Register eligibility significance criteria are met.

4.7.3 The main impact at the higher elevations is the destruction of protective ground cover, promoting vandalism and erosion. A different perspective is that the sites will be lost for future research, interpretive purposes, and affirmative management action, whether they are inundated quickly or eroded and inundated slowly. The same number of sites would be affected regardless of the method of pool raise chosen. The problem can be further viewed in terms of the management, financial, and scheduling factors which necessarily affect cultural resource management at Lake Red Rock. It has been noted that with a single-step pool raise, problems with scheduling and funding could adversely affect site evaluation and mitigation projects. On the other hand, the more steps involved in raising the pool level, the more time becomes available for the Corps of Engineers to obtain the funding necessary to properly complete site evaluations and mitigation.

4.7.4 EVALUATION OF THE NO ACTION ALTERNATIVE

4.7.4.1 Under the No Action alternative, the District would continue to follow the recommendations contained in the document entitled, Cultural Resources Management Plan, Lake Red Rock, Iowa, prepared by Gilbert/Commonwealth, Incorporated. The management plan was reviewed and approved by the District and the Iowa SHPO. Essentially, the plan requires that the District fulfill its responsibilities to Identify, Evaluate (for National Register significance), and Protect historic properties under Federal control. These responsibilities are required by the National Historic Preservation Act, the Archeological and Historic Preservation Act, Executive Order 11593, and 36 CFR Part 800. Hence, all of the Identification work (now completed) required for the pool raise would have had to have been done regardless. The major difference is the accelerated timeframe. The same applies to Evaluation studies currently underway for potentially significant sites below elevation 760 feet NGVD. The only major differences are: (1) the pool raise will begin a new cycle of erosion at higher elevations, endangering sites that would not ordinarily be endangered in a short timeframe; and (2) mitigation actions (data recovery excavations) would not have to be done without the pool raise unless, at some time in the future, small raises began to affect significant sites. The difference for consideration under the SEIS is that mitigation for the No Action alternative could be spread over a 25- to 50-year period. Under any of the action alternatives, mitigation would have to be done within relatively short timeframes.

4.7.4.2 Based upon recent survey investigations by Gilbert Commonwealth staff (Roper 1986), it was determined that 159 sites (of the 420 total) were located below elevation 760 feet NGVD. These 159 sites comprise the known cultural resource base which must be considered for impact assessment purposes under Alternatives 1, 2, 3, 4, and 7.

4.7.4.3 Of the 159 sites, 67 did not require further work beyond the survey level of investigation. This determination was made by Gilbert Commonwealth staff in the form of a recommendation. District staff archeologists and the Iowa SHPO staff archeologist agreed with the recommendation because the 67 sites were: (1) essentially destroyed; (2) severely disturbed; (3) inundated; and/or sufficiently studied and determined ineligible. The 67 nonsignificant sites do not need to be considered further in the impact analysis. The sites are listed in table EIS-16.

TABLE EIS-16

Sites Requiring No Further Work (all 13MA....)

Band 1: 725 to 740 feet NGVD (36 sites)

119	163	281	413
122	164	283	419
123	165	284	420
127	166	292	422
128	167	296	423
129	203	325	428
134	204	376	436
136	219	396	460
162	220	397	461

Band 2: Above 740 feet NGVD (31 sites)

247	339	388	430
253	340	407	431
265	343	416	433
276	349	417	442
280	352	424	443
301	355	426	447
331	364	427	455
334	365	429	

4.7.4.4 Hence, only 92 archeological sites remained for consideration at the testing or National Register evaluation phase (table EIS-17).

The field work for the National Register of Historic Places evaluation of these 92 archeological sites between elevations 728 and 760 feet NGVD was completed by July 1987. This work was accomplished through two separate contracts with American Resources Group, Ltd. (ARG) from Carbondale,

Illinois. Results of these investigations are reported in the reports entitled Archeological Testing of 33 Sites, Lake Red Rock, Iowa, Pool Raise Project (Leah Rogers and Brad Koldehoff, 1987) and Archeological Testing, NRHP Eligibility Determination and Impact Assessment, Lake Red Rock, Iowa, Pool Raise Project (Leah Rogers, David Stanley, and Jeffery Anderson, 1987).

TABLE EIS-17

Potentially Significant Sites Evaluated
by American Resources Group (All 13MA...) in 1986 and 1987

Band 1: 725 to 740 feet NGVD (24 sites)

13	327	403
23	338	405
26	359	406
210	361	414
218	373	421
262	394	434
295	395	439 Fifield
326	400	444

Band 2: Above 740 feet NGVD (68 sites, 59 of which were tested under a second contract)

Sites Evaluated by ARG in 1987 (second contract)				Sites Evaluated by ARG in 1986 (first contract)
32	298	354	398	44
42	299	356	399	209
		358	404	212
84	318	366	415	317
207		367	425	320
208	321	370	432	350
	322	371	435	351
	324	372	438	384
216	329	378	440	387
223	330	382	445	
246	341		446	
261	342	385	449 Dunreath	
263	344	386	453	
264	345		454	
266	347 Percy	389	456	
282		392	458	
286		393	459	

4.7.4.5 Based on this work, a total of 6 prehistoric and 5 historic sites have been determined eligible for the National Register by the Iowa SHPO. Table EIS-18 is a summary of the NRHP eligible sites to be affected by the pool raise project. Data recovery plans have been coordinated with the Iowa SHPO and Advisory Council on Historic Preservation (ACHP) for 3 of the 11 sites, and fieldwork was completed on these 3 sites during the fall of 1987 by ARG. Final reports on this work are due by the spring of 1988.

TABLE EIS-18

Status of Data Recovery for Significant Archeological Sites
Present Within the Impact Zone for the Proposed Pool Raise

Site (13MA-)	Elevation (NGVD)	Site Type	Status
262	740-745	Historic farmstead	Fieldwork Complete
400	735-755	Historic farmstead	Fieldwork Complete
387	748-768	Prehistoric	Fieldwork Complete
207	740-750	Prehistoric	Fieldwork Summer 1988
208	740-750	Prehistoric	Fieldwork Summer 1988
209	740-750	Prehistoric	Fieldwork Summer 1988
266	740-750	Historic farmstead	Fieldwork Summer 1988
324	740-750	Prehistoric	Fieldwork Summer 1988
385	740-760	Prehistoric	Fieldwork Summer 1988
347	740	Historic Village	Fieldwork Summer 1988
449	740-770	Historic Village	Fieldwork Summer 1988

4.7.4.6 The investigation of the remaining 8 sites is forthcoming. Two separate contracts for data recovery -- one for historic sites and one for prehistoric sites -- are anticipated for the spring of 1988. Fieldwork for both of these contracts should be completed during the summer of 1988. With the completion of this fieldwork, the pool raise project (to an elevation of 760 feet NGVD) will have No Adverse Effect on cultural resources.

4.7.4.7 Based on the preliminary mitigation plans presented in the American Resources Group NRHP evaluation report, the Iowa SHPO, by letter dated October 22, 1987, agreed to a conditional finding of no adverse effect for the proposed pool raise. The finding is conditional upon provision of final plans and proposed data recovery plans for the seven sites. The documented finding of no adverse effect was provided for comment to the Advisory Council on Historic Preservation by letter dated March 1, 1988, as specified in 36 CFR 800.5. By letter dated April 12, 1988, the Advisory Council agreed with this determination.

4.7.5 EVALUATION OF ALTERNATIVE 2. The discussion for paragraph 4.7.4.1 above applies, with the additional consideration of potential changes in erosion downstream. To date, no historic properties have been discovered on federally-controlled land below the dam. Hence, no additional impacts are anticipated based upon existing information. Also, no changes in erosion are anticipated as a result of increased release rates.

4.7.6 EVALUATION OF ALTERNATIVE 3. The discussion for paragraph 4.7.4.1 above applies. Two sites below 740 feet NGVD will have to be considered for mitigation along with 9 sites between 740 and 744 feet NGVD. It is anticipated that data recovery at all 11 sites will be completed in 1988. Impacts include inundation (removal from public purview) and new erosional regimes.

4.7.7 EVALUATION OF ALTERNATIVE 4. The discussions for paragraphs 4.7.4 and from 4.7.5, above apply. The major difference is that this alternative provides additional time for mitigation work. Mitigation of three sites has been accomplished.

4.7.8 EVALUATION OF ALTERNATIVE 5. The discussions for paragraphs 4.7.4, 4.7.5, and 4.7.6 above apply. The 3-step raise would provide even more time to complete mitigation work.

4.7.9 EVALUATION OF ALTERNATIVE 7 (PREFERRED ALTERNATIVE). The discussion for paragraph 4.7.6 applies.

4.7.10 SUMMARY OF IMPACTS TO CULTURAL RESOURCES. Regardless of which action alternative is adopted to raise the pool, the impacts will be essentially the same. Adverse effects will occur due to inundation and erosion to the same number of sites in each case. The only significant difference is the time period over which the impacts will occur. More time means that mitigation work can be phased over a number of fiscal years. A rapid one-step raise means that all mitigation work will have to be done in one or two fiscal years.

SECTION 5 - LIST OF PREPARERS

This document was prepared by the U.S. Army Corps of Engineers, Rock Island District, with support by contractor staff.

Name	Role in EIS Preparation	Experience and Field of Expertise
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Willis Tait	Real Estate Impact Document Review	Chief - Rock Island District Real Estate Division
Patricia Risser	Socio-Economic Impacts	Social Science Analyst - 4 years professional experience perparing economic and social analyses
Daniel Fetes	Socio-Economic Impacts	Economist - 3 years experience Corps of Engineers economic analysis
Marvin Martens	Hydraulic Analysis and Document Review	Hydraulic Engineer - 18 years experience
Nelson Cordoba	Sediment Entrapment Analysis (WCP)	Hydraulic Engineer - 6 years experience
David Martin	Hydraulic Analysis	Hydraulic Engineer - 10 years experience
Clinton A. Beckert	Water Quality Impacts (WCP)	Hydrologist - 6 years experience

Thomas A. Kirkeeng	HEC-2 Backwater Analysis (WCP)	Hydraulic Engineer - 2 years experience
Vern Greenwood	Geotechnical Review and Analysis	Professional Geologist - 21 years experience
Staff	NRMS Data Document Review	Natural Resource Management Branch, Rock Island District
Consultant, Environmental Science and Engineering, St. Louis, MO.	Provided study support and background information used in this document.	

Company/Person	Role in EIS Preparation	Experience and Field of Expertise
Environmental Science and Engineering, Inc.		
Ron Alderfer, Ph.D.	ESE Report Review	17 years experience in the area of environmental impact assessment, toxic and hazardous material and bio-physical ecology
Keith Govro, MS	ESE Report Coordination, Limnology, Aquatic Ecology.	9 years limnology, aquatic ecology and impact assessment
William Elzinga, MS	Terrestrial Ecology, Land Use	5 years aquatic and terrestrial ecology and in environmental impact assessment
Rick Folkemer, P.E.	Hydrology Water Quality, ESE Report Coordination	14 years resources management, wastewater management, water chemistry, land planning and development.
Rich Hall, MS	Fisheries, Aquatic Ecology	11 years aquatic ecology, limnology and fisheries management.
Snyder & Associates, Inc.		
James Bradshaw, L.A.	Task Manager, Land Use and Recreations	25 years landscape architecture land use and planning.
Stephen Rowe	Task, Manager, Socioeconomics	18 years residential and industrial site plans and development, waste water collection systems and land use control, municipal land use planning.
Dennis Snyder, P.E.	ESE Report Review - Land Use, recreations, socioeconomics	15 years civil and municipal engineering.
Del Hanson, B.S.	Land Use and recreation	30 years engineering and management.
Geotechnology, Inc.		
Lawrence Rosen, MS	Geotechnical	6 years mineral exploration and geotechnical and geoenvironmental projects.

Company/Person	Role in EIS Preparation	Experience and Field of Expertise
Don McQueen, MA, MBA	Task Manager, Geotechnical	15 years environmental assessments, site characterizations, geophysical investigations and evaluation of sites for earthen structures.
American Resources Group, Ltd.		
Mike McNerney, MA		16 years archaeology and cultural resources assessments.
Mark Hill, MA		3 years field archaeology.
Leah D. Rogers, MA		? Field archeology historical studies

SECTION 6 - PUBLIC INVOLVEMENT

6.1 PUBLIC AND AGENCY COORDINATION. The Draft SEIS was sent to Federal, State, and local agencies, as well as private groups and individuals for comments. A list of document recipients is included in the distribution list. This list was updated following draft review, and the final SEIS has been sent to the updated list.

6.1.1 The following agencies have been contacted during the planning process for this study:

1. Iowa Office of Planning and Programming;
2. Iowa Department of Water, Air, and Waste Management;
3. Iowa Department of Natural Resources (1986);
4. Iowa Secretary of Agriculture;
5. Soil Conservation Service;
6. Iowa Department of Transportation;
7. Iowa Department of Soil Conservation;
8. U.S. Fish and Wildlife Service; and
9. Des Moines River Conservancy District.

6.1.2 PUBLIC INVOLVEMENT. Reference main report Appendix H. - Public Involvement.

6.1.3 AGENCY COORDINATION

6.1.3.1 The Fish and Wildlife Coordination Act Report (CAR) is included in main report Appendix I - Pertinent Correspondence. Recommendations contained in that report, with District responses, were as follows:

1. The tentatively selected plan be modified to include a new conservation pool elevation of 736, rather than 734, in order to provide potential for greater fishery benefits.

DISTRICT RESPONSE: The recommended alternative, Plan 7, involves an immediate conservation pool raise to elevation 734 feet NGVD, with a 2-foot fall pool raise for migratory waterfowl. The pool raise to elevation 734 feet NGVD was selected for the following reasons:

1. It will preserve a number of options for future resource management.

2. It will permit maximum flexibility with respect to cost-sharing recreational facility relocations with State and local governments.

3. It will preserve more flood control capacity (than higher pools).

2. The date for implementation of the new conservation pool elevation be selected in coordination with the Iowa Department of Natural Resources, in order to provide the maximum potential benefit to fish and/or wildlife habitats.

DISTRICT RESPONSE: Concur.

3. The hydrological studies to determine the extent and feasibility of a variable fall pool raise for fish and wildlife management be initiated immediately.

DISTRICT RESPONSE: Following approval of a pool raise alternative, the District will commence necessary hydraulic modeling for the selected pool raise regulation plan. Due to the array of model runs per any given alternative, we prefer to withhold flexible fall raise hydraulic work until completion of this study rather than model each possible alternative under each possible hydrographic condition.

4. Boat ramps and public access facilities be relocated at Federal cost, as authorized by Section 111 of Public Law 94-587.

DISTRICT RESPONSE: The report recommends an immediate increase in the elevation of the conservation pool to elevation 734.0. At this level, no modifications to Corps facilities are required. Thus, cost-sharing is not an issue at this elevation. The report recognizes the need to raise the elevation of the conservation pool above elevation 734 at some time in the future due to sedimentation. We hope to be able to gradually replace the recreational facilities as they wear out with new facilities which will be compatible with the higher pool elevation. The cost-sharing policy in effect at the time of the replacement of the recreational facilities will be applied.

5. Expeditious fee title acquisition from willing sellers of flowage easement tracts contiguous with Lake Red Rock project lands, as authorized by Public Law 99-190 and Section 111 of Public Law 94-587.

DISTRICT RESPONSE: The land acquisition authorized by Public Law 99-190 is currently in progress. The District has prepared its initial report on this action and has forwarded it to Corps higher authority for approval.

6. The easement tracts acquired in fee by the United States be made available to the Iowa Department of Natural Resources, by amendment to its existing wildlife license.

DISTRICT RESPONSE: As noted above, the District has submitted required documentation to gain approval for land acquisition. All lands thus acquired would be made available to the IDNR through its fish and wildlife management license.

7. The Lake Red Rock General Plan be amended to reflect the revised project lands allocated to fish and wildlife purposes, when the acquisition program is completed.

DISTRICT RESPONSE: We anticipate that such a modification will be necessary upon completion of each real estate design memorandum pursuant to Public Law 99-190.

6.1.3.2 Correspondence provided by the IDNR pursuant to the Fish and Wildlife Coordination Act is included in Appendix I - Pertinent Correspondence. Positions contained in that correspondence are as follows:

1. That the conservation pool be immediately raised to 736 feet NGVD and that the pool be further raised within two years to 742 feet NGVD. That all costs for evaluating, redesigning and reconstructing facilities be incurred by the federal government.

DISTRICT RESPONSE: The District considers Alternative 7, a one-step raise, to be the alternative which provides a balance between the immediate needs of natural resource and recreation interests, and the interests of flood control.

Also, note the District response to FWS recommendations 1 and 4, preceding.

2. That the raising of the conservation pool to 742 feet NGVD would inundate approximately an additional 10,000 acres of land. The easement lands at Red Rock Reservoir should be acquired in fee title by the U.S. Army Corps of Engineers and included in the fish and wildlife license to the Department of Natural Resources.

(Note: Since circulation of the draft main report with Draft SEIS, a revised one-step plan has been proposed, reviewed, and is discussed in this document as the preferred alternative. The IDNR's response to the revised preferred alternative is contained in Appendix I - Pertinent Correspondence of the main report.)

DISTRICT RESPONSE: The District has submitted required documentation to Corps higher authority to gain approval for land acquisition (flowage easement) under Public Law 99-190. Decisions on final disposition of lands acquired under this program will be made after lands from willing sellers are acquired and configuration of ownership boundaries are known and established.

3. That the Corps of Engineers institute a flexible fall pool raise in future management plans. This flexible fall pool raise would be between 0 and 6 feet per year and could be in two or more stages within a year. Coordination would be between the Director of the Iowa Department of Natural Resources and the District Engineer of the U.S. Corps of Engineers in late August of each year. This flexible and staged fall pool raise would allow reponse to a particular year's water level and vegetation conditions in providing fall habitat for migratory waterfowl.

DISTRICT RESPONSE: See reponse to FWS Recommendation 3, preceding.

4. I also affirmed the state's position that the Corps of Engineers must maintain a minimum of 50,000-acre feet of conservation storage in Red Rock Reservoir for the purposes of low-flow augmentation.

DISTRICT RESPONSE: We concur. This feature was incorporated into all alternatives discussed in detail and plans evaluated in detail in the Water Control Plan.

5. I recommend improved regulation on the release rates which entail lengthening the period during which outflow will not exceed 30,000 cfs by ten days and increasing the maximum outflow from 18,000 to 22,000 cfs when pool elevation is above 760 feet NGVD during the growing season.

DISTRICT RESPONSE: We concur. This is a feature of the revised regulation plan for Lake Red Rock.

6.2 MITIGATION

6.2.1 The extent to which mitigation is justified for a project is heavily dependent upon the future condition of project area should the project not be implemented. The Corps does not mitigate for impacted resources that would be lost even if there was no action on the part of the Corps. To predict future conditions is especially difficult for this project, because multiple factors affect the future (i.e., precipitation, soil conservation practices, and availability of Federal funds, etc.). These factors have all been considered in an attempt to predict the future of the Red Rock Reservoir.

6.2.2 Based on the information contained in this document, it appears that the resources to be permanently inundated are now inundated so frequently as to make their usefulness as either terrestrial or aquatic habitat extremely limited. Water-based recreation, including fish and wildlife-based recreation, also is limited by sedimentation at or near access points. Any pool raise action is considered an enhancement measure due to positive results in both aquatic habitat improvement and lake access improvement.

6.2.3 Currently, the Corps does not mitigate for impacts if the future "without" condition indicates the habitat will be lost even if an alternative is not implemented. The difficulty lies in determining the difference between the habitat conditions of the "future with project conditions" and the "future without conditions." Since some type of pool raise would eventually be required under the base condition operating plan, there would be little overall difference between the future with and future without conditions. Therefore, mitigation does not appear to be warranted for this action.

6.3 OTHER CONTACTS. The following contacts were made by contractor staff during the preparation of the SEIS:

- Iowa Development Commission -- Doug Getter
- Iowa Department of Natural Resources -- Sue Davenport
- Marion County Conservation Commission -- Steve Edwards, Executive Director
- Marion County Planning Department
- Jasper County Planning Department
- Warren County Planning Department
- Garden & Associates, Oskaloosa
- Corps of Engineers -- George Wells, Waterways Planning Branch, Pool Raise Study Manager (1984-1986)
- Corps of Engineers -- Bob Clevenstine, SEIS Project Manager, Environmental Analysis Branch
- City of Knoxville -- Steve Inskeep, Public Works
- City of Pella -- George Brown, Water Supervisor
- Iowa Department of Natural Resources
  - James Mayhew, Fisheries
  - Tom Putnam, Boone County Fisheries
  - Richard Bishop, Wildlife
  - John Olson, Water Quality
- Iowa State University
  - Robert Bauchman, Animal Ecology
  - Bruce Menzel, Animal Ecology
  - Bill Clark, Animal Ecology
  - Gary Atchison, Animal Ecology
  - Donna Lutz, Civil Engineering
- Drake University
  - Dr. P. J. Kingsbury, Limnologist
  - Dr. Crumpton, Botany
- Iowa Conservation Commission
  - Natural Resources, Threatened and Endangered List -- John Fleckenstein
- Iowa Academy of Science
  - James G. MacMillian, Director
- U.S. Geological Survey
  - Nick Nelchen, Surface Water Program
  - Scott Leekin, Geology Department
  - Donivan Gordan, Water Resources
- Iowa State Water Resources
  - Robert Lohnes
- University State Hygienic Laboratory
  - Keith Cherryholm, Water Quality

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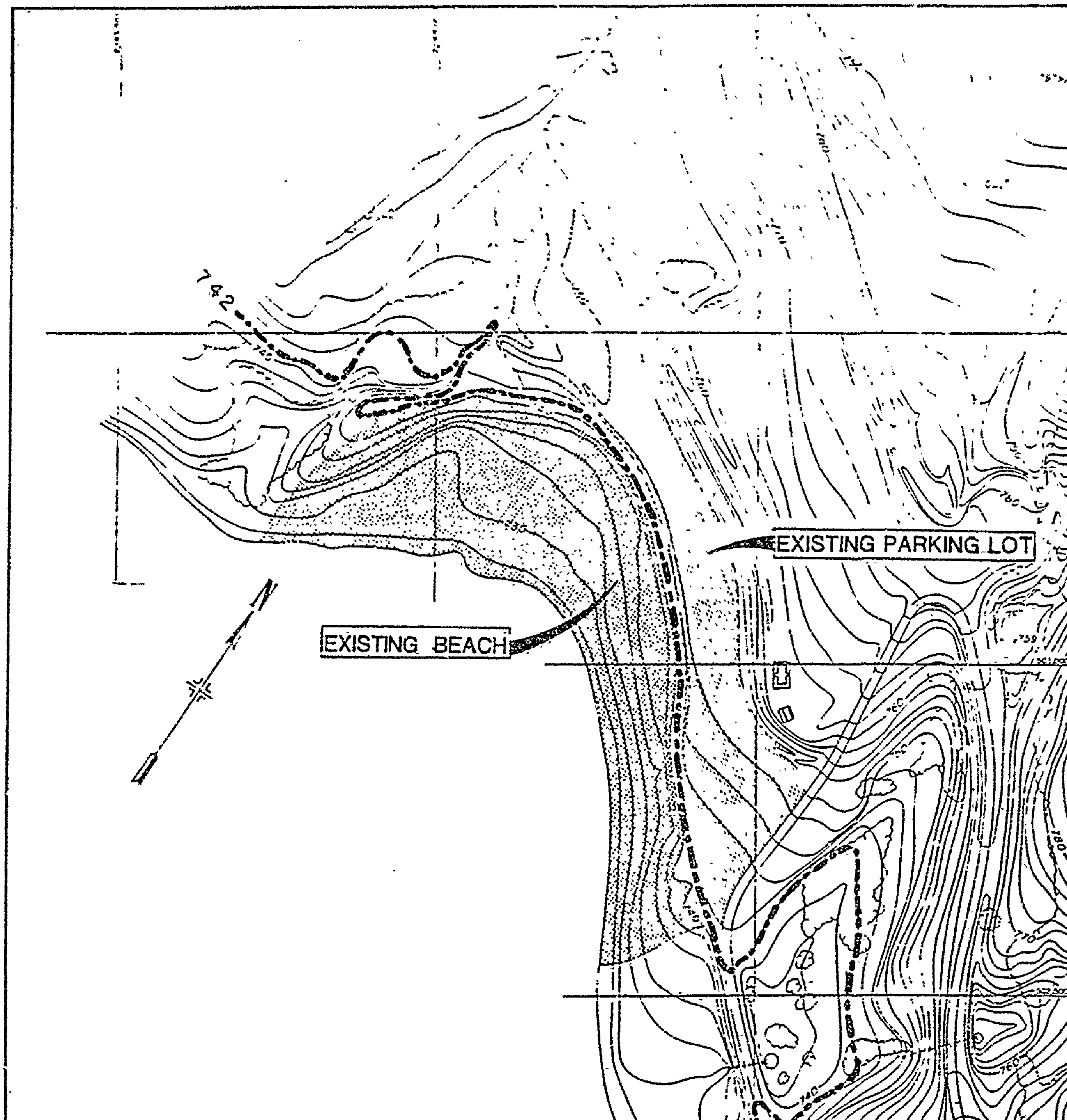
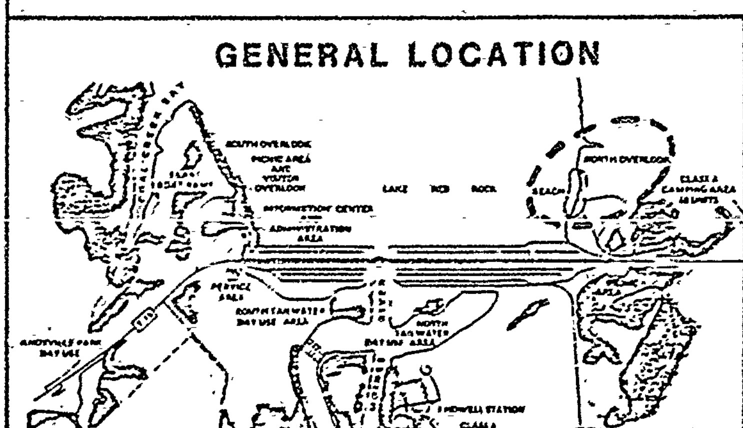
INDEX

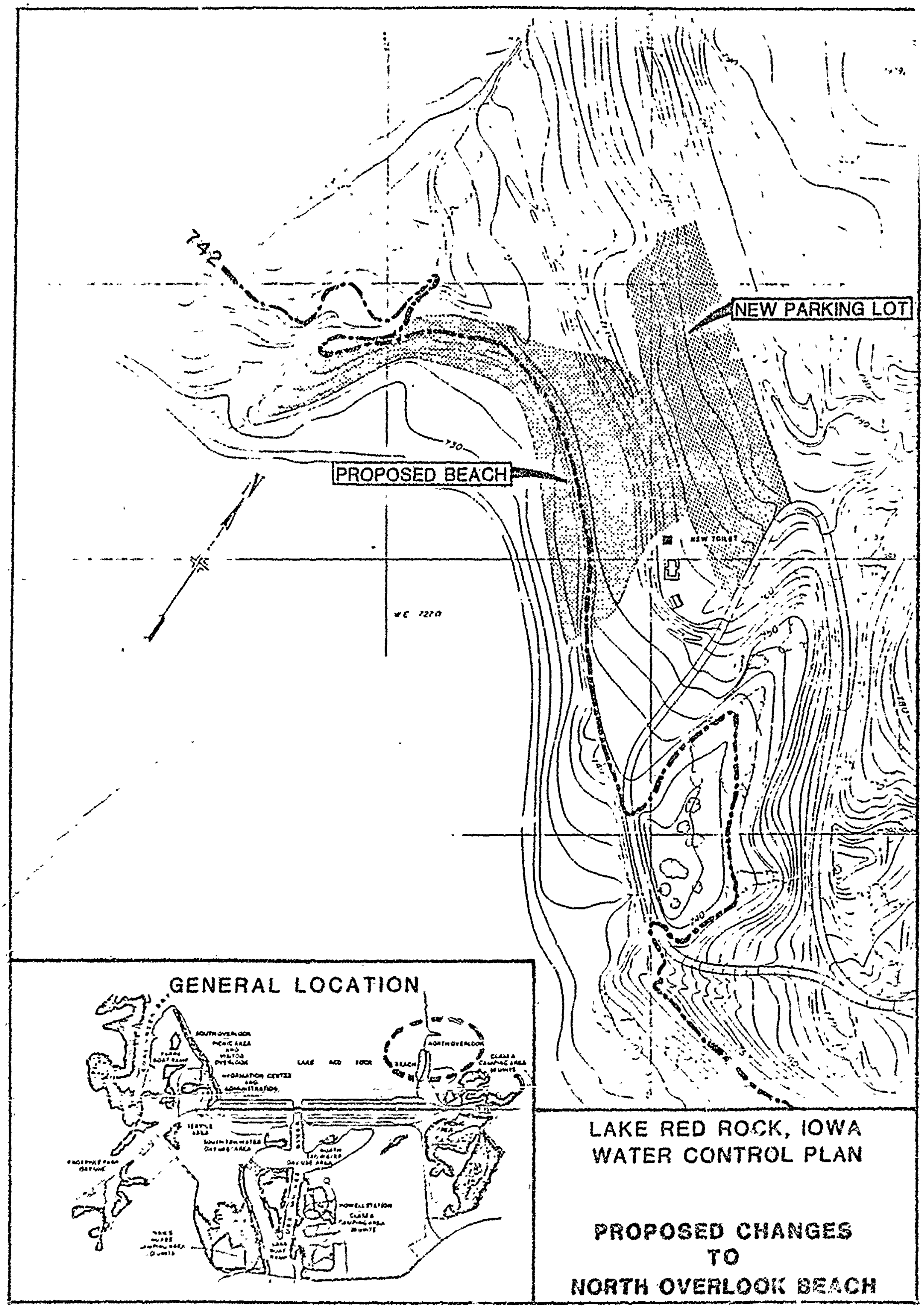




LAKE RED ROCK, IOWA
WATER CONTROL PLAN

EXISTING CONDITIONS
(5-7-87)
NORTH OVERLOOK BEACH

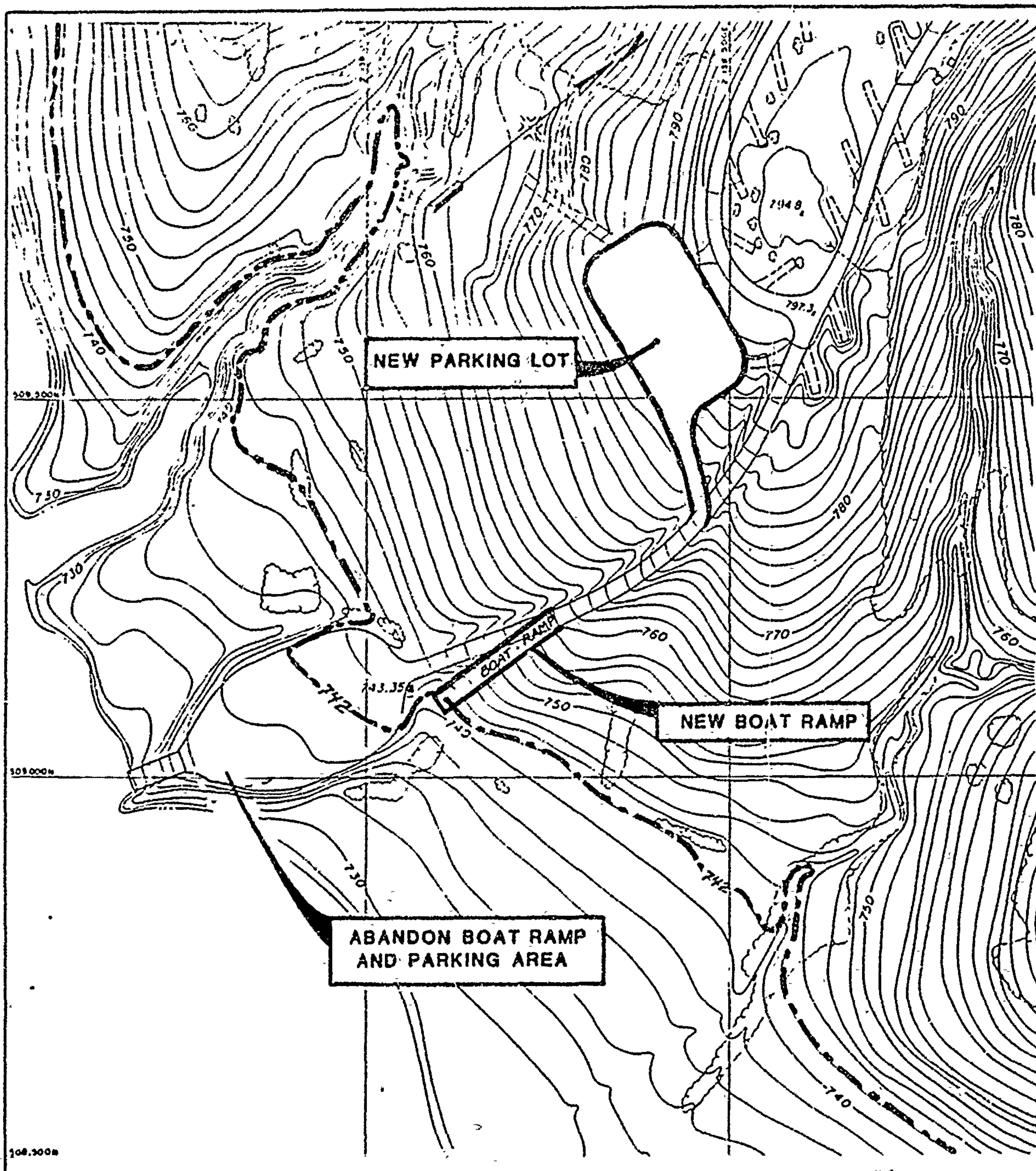
PLATE EIS-1

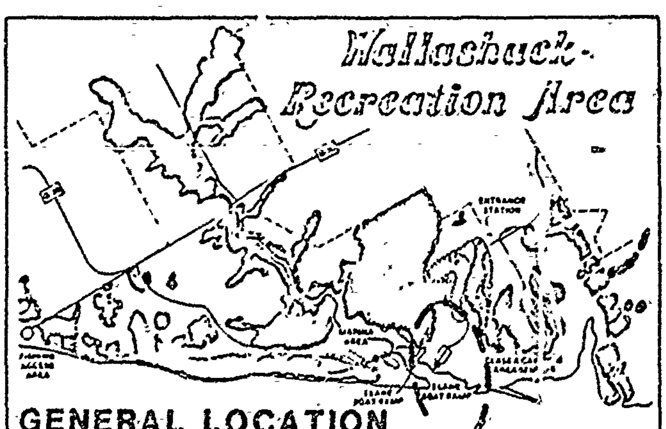


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES
TO
NORTH OVERLOOK BEACH

PLATE EIS-2

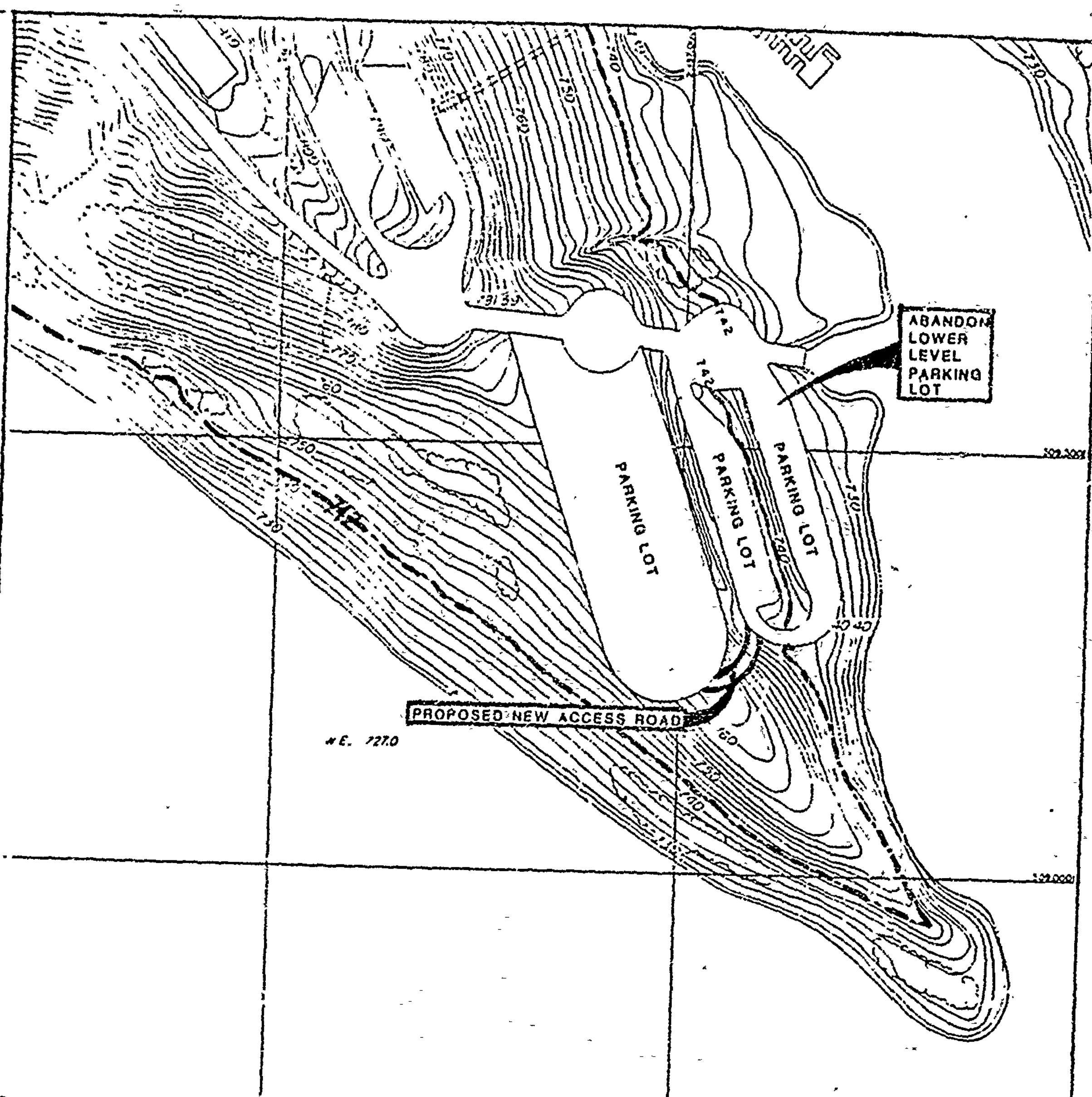


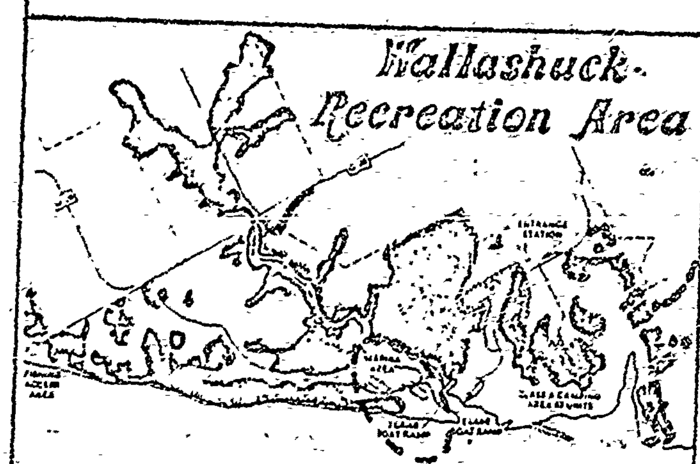


LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES
TO
EAST WALLASHUCK

PLATE EIS-3



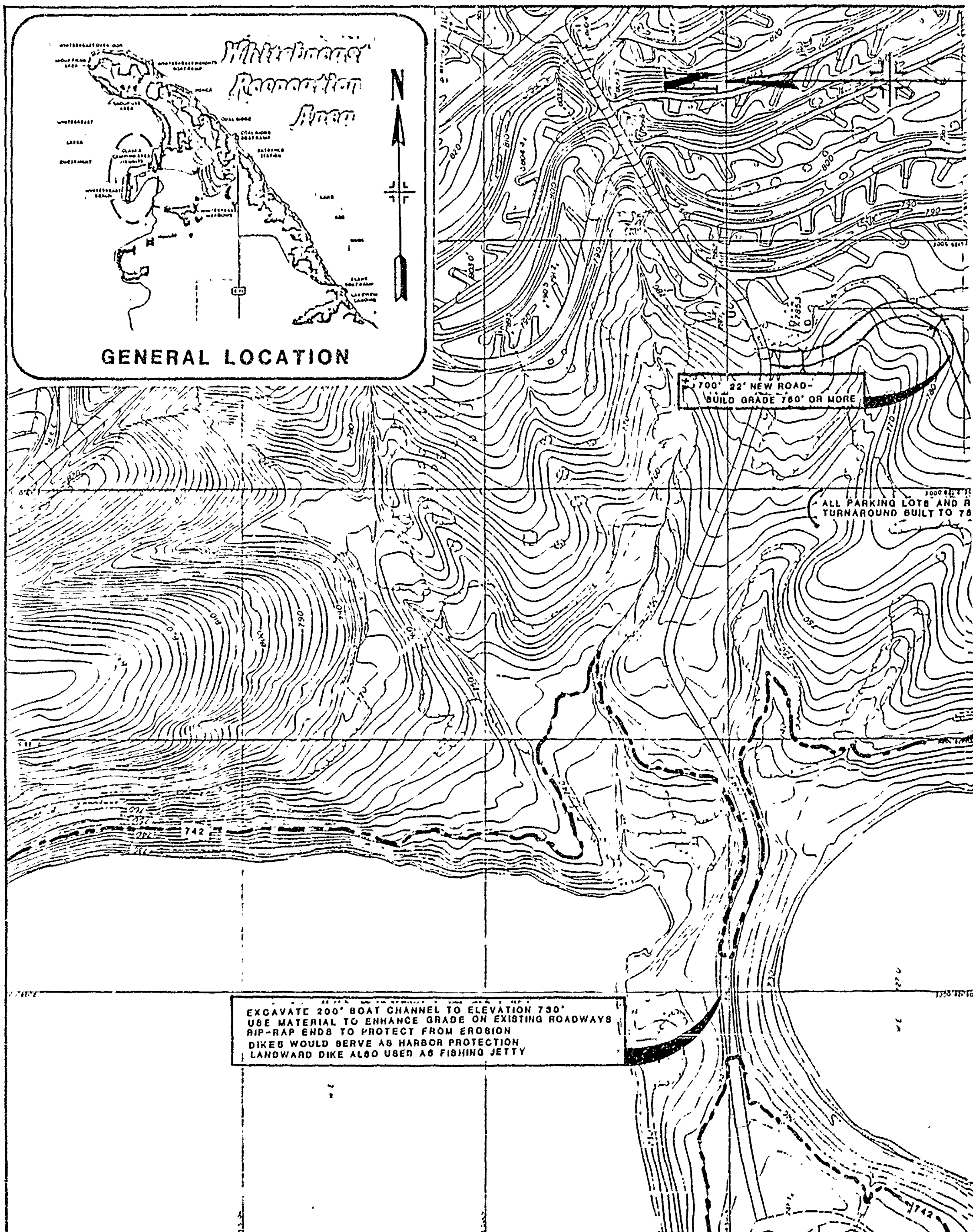


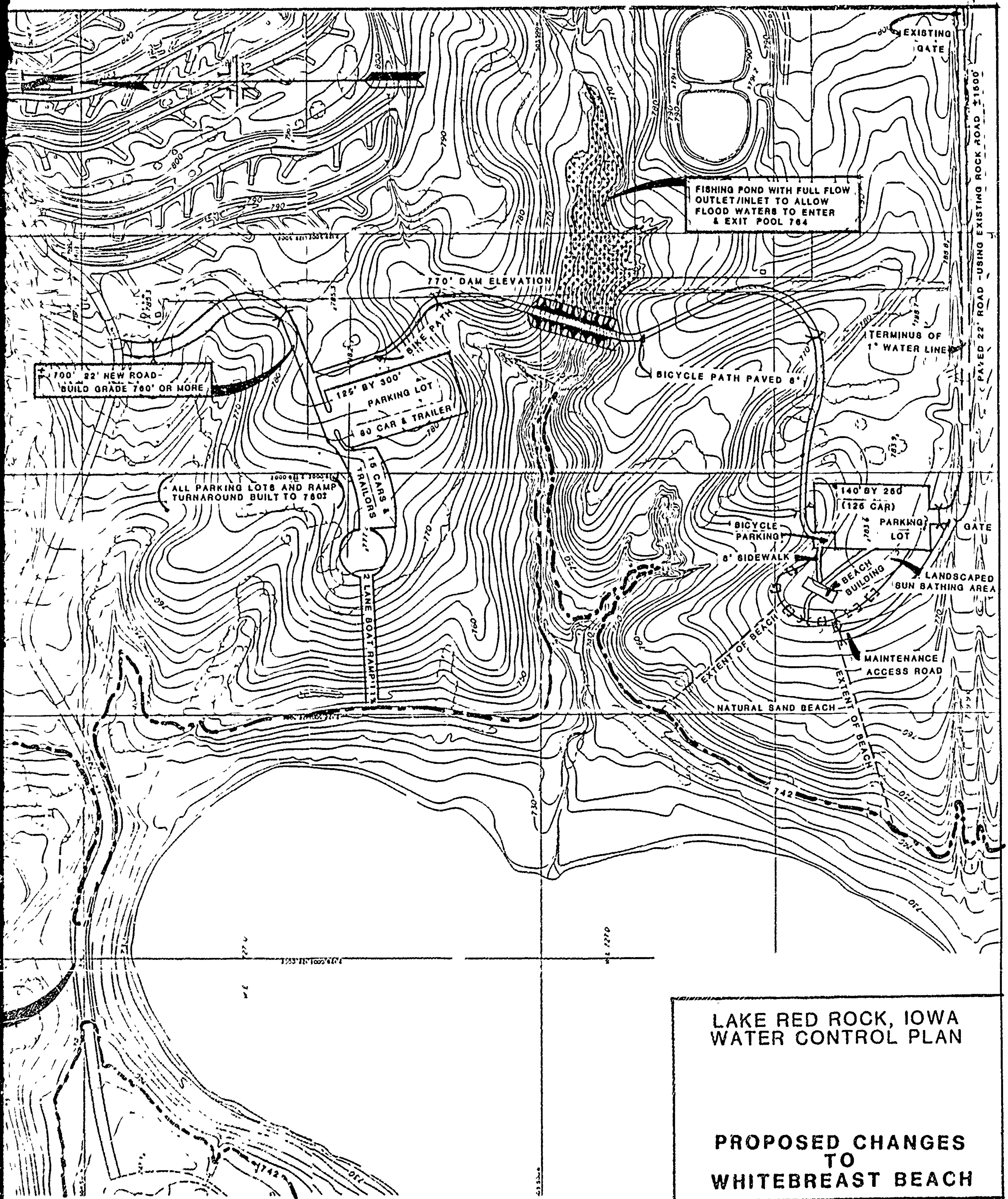
GENERAL LOCATION

LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES
TO
WEST WALLASHUCK

PLATE EIS-4


Whitebreast Recreation Area
N
GENERAL LOCATION
700' 22' NEW ROAD-
BUILD GRADE 760' OR MORE
ALL PARKING LOTS AND R
TURNAROUND BUILT TO 78
742
EXCAVATE 200' BOAT CHANNEL TO ELEVATION 730'
USE MATERIAL TO ENHANCE GRADE ON EXISTING ROADWAYS
RIP-RAP ENDS TO PROTECT FROM EROSION
DIKES WOULD SERVE AS HARBOR PROTECTION
LANDWARD DIKE ALSO USED AS FISHING JETTY



LAKE RED ROCK, IOWA
WATER CONTROL PLAN

PROPOSED CHANGES TO WHITEBREAST BEACH

PLATE EIS-5

PROGRAMMATIC AGREEMENT

APPENDIX A

DRAFT

PROGRAMMATIC AGREEMENT

LAKE RED ROCK, IOWA
MARION, WARREN, JASPER, AND POLK COUNTIES

WHEREAS, the U.S. Army Corps of Engineers, Rock Island District (hereinafter referred to as the Corps) has completed the construction of the Lake Red Rock Flood Control Project, on the Des Moines River, Iowa; and

WHEREAS, the Corps, the Iowa State Historic Preservation Officer (hereinafter referred to as SHPO), and the Advisory Council on Historic Preservation (hereinafter referred to as ACHP) have consulted on project construction and operations effects; and

WHEREAS, the Corps has made significant and reasonable progress in carrying out its responsibilites under Sections 106 and 110 of the National Historic Preservation Act (as amended in 1980) and all related laws, regulations, and guidelines; and

WHEREAS, the general nature and extent of the cultural resource base is fairly well known based upon approximately 10 years of intensive study, the development of cultural resource overviews, the delineation of geomorphological models, and the completion of an acceptable historic properties management plan (see attached bibliography); now,

THEREFORE, the Corps, the SHPO, and the ACHP agree that historic properties and effects to these properties have been fully considered for project operations purposes and that execution of the attached stipulations will ensure appropriate treatment of significant historic properties.

Execution of this Programmatic Agreement (PA) evidences that the Corps has afforded the Iowa SHPO and the ACHP a reasonable opportunity to comment on the Lake Red Rock Project, project operations, and effects to historic properties, and that the Corps has taken into account the effects of its undertaking on historic properties.

District Engineer U.S. Army Corps of Engineers	Date
Iowa State Historic Preservation Officer	Date

DRAFT

_______________________________________ _______________
Advisory Council on Historic Preservation Date

STIPULATIONS

1. The Corps will follow the guidance set forth in the Cultural Resources Management Plan (Roper and Bastian 1986) and ensure that the Plan is updated annually.

2. The Corps will, based upon the results of the two pool raise studies by Rogers (1986), provide for the preservation of National Register eligible sites through data recovery or architectural recording pursuant to 36 CFR Part 800 and appropriate guidances such as the ACHP's manual entitled Treatment of Archeological Properties and guidelines published by the National Park Service for HABS/HAER documentation. Data recovery and architectural recording plans and the results of their execution shall be coordinated with the SHPO.

3. As a result of the investigations listed in the attached bibliography, the Identification and Evaluation phases for Lake Red Rock Project historic properties shall be considered completed. Future activities in the project "main stem" (that area southwest of Iowa Highway 14) will consist primarily of testing of experimental survey/testing/excavation techniques, erosion monitoring, and the development of public interpretation trails, displays, slide shows, brochures, lectures, and movies. These activities will be done if funds are available. Except for sites located below elevation 760 feet NGVD to be mitigated prior to execution of the pool raise project, no other National Register eligible properties have been found. Mitigation work may be phased by elevation to allow for adequate funding and coordination; however, all fieldwork will be completed before inundation.

4. The Corps recognizes that very little historical, archeological, geomorphological, and architectural work has been done west of Iowa State Highway 14 in the area managed by the Iowa Department of Natural Resources (formerly ICC) and the Iowa State Parks Commission. This has been because impacts were perceived as relatively low in relation to the "main stem" area. Very little construction occurs in refuge areas, and sedimentation rather than erosion occurs. However, the Corps recognizes that the same mandates to Identify, Evaluate, and Protect apply. In fact, this fairly unaltered area may be the only place within project boundaries where the prehistory and history of the central Iowa River Valley can be studied in undisturbed contexts. Therefore, the Corps will:

DRAFT

a. Continue intensive geomorphological, archeological, and historical studies in the refuge areas pursuant to the legal mandate to Identify, Evaluate, and Protect significant historic properties on federally controlled lands, as funds are made available;

b. Work with the Iowa Department of Natural of Resources to ensure that they apply the Corps' Cultural Resource Management Plan, and to attempt to establish expedited procedures under their lease agreement for coordination with the Corps Archeologists and the Chief SHPO Archeologist for the Identification, Evaluation, and Protection of significant historic properties;

c. Nominate significant properties to the National Register of Historic Places and carefully evaluate any impacts and impact reduction/avoidance strategies, and responsible management of Federal collections and reports;

d. Use sampling strategies for field studies in order to obtain fairly refined overview and site distributional information for refuge areas, supplemented by detailed study (survey, testing, data recovery) in accordance with Section 106, Executive Order 11593, 36 CFR 800, and the Archeological and Historic Preservation Act, for specific projects or impacts affecting the cultural resource base; and

e. Proceed with nomination of sites to the National Register of Historic Places as a protection strategy when it appears that they will not be affected by project operations

5. . Any operations, construction, or management actions within the "main stem" area southwest of Iowa State Highway 14 are cleared from further Section 106 review except for eligible or listed sites and unanticipated resources encountered during construction which shall be treated in accordance with 36 CFR 800.11.

6. The Corps will proceed with the evaluation and mitigation actions for the pool raise project. All sites considered to be eligible for listing in the National Register by Corps and SHPO staffs will be included in any mitigation program. Prior to the execution of any mitigation program, the Corps will provide the SHPO with copies of documentation, Scopes of Work, and/or mitigation plans for review and comment. The Corps will delist any sites considered eligible for Section 106 purposes that undergo data recovery plan. All disputes will follow the procedures contained in 36 CFR 800.

7. Nothing in this PA is intended to prevent the Corps from consulting more frequently with the SHPO or the ACHP concerning any questions that may arise, or on the progress of any actions covered under this PA. Because of the comprehensive investigations conducted up to elevation 760 feet NGVD, the following activities can be categorically excluded from further

Section 106 review: boat ramp, parking lots, bank stabilization/riprapping, agricultural leases, trails, and roads. A list of all actions cleared under this exclusion shall be provided to the SHPO on an annual basis.

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8. Any of the signatories to this PA may request a reconsideration of its terms or revoke the PA upon written notice to the other signatories. This PA may be extended beyond Fiscal Year 1997 by agreement between the signatories and written concurrence of the Executive Director of the Council.

9. Execution of subitems 4a-d of this PA will be subject to availability of funds. The Corps will make every effort to program funds for MOA tasks. Execution of actions under subitem 5 is required prior to any pool raise.

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TERRESTRIAL BIOTA

APPENDIX B

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR OPERATION AND MAINTENANCE
AT
LAKE RED ROCK, IOWA

APPENDIX B
TERRESTRIAL BIOTA

TABLE OF CONTENTS

TABLE B-1

Habitat Characteristics (Acres) of the Lake Red Rock Fee Area (Page 1 of 3)

Compartment	PR*	GR	AG	PL	DE	BR	SA	MA	FB	WE	DF	TOTAL
(1) ICW 213†	—	—	119	—	3	33	—	—	4	—	26	185
(2) ICW 313	—	—	98	—	16	34	—	—	—	27	220	395
(3) ICW 314	—	—	217	—	88	30	18	—	14	54	216	637
(4) ICW 413	—	—	329	—	6	—		—	25	—	31	393
(5) ICW 414	—	—	13	—	—	—	39	—	—	7	233	292
(6) ICW 215	—	6	474	—	—	—	—	45	35	6	71	637
(7) ICW 315	—	—	503	—	70	—	—	—	9	30	142	754
(8) ICW 217	—	—	405	—	—	216	—	—	—	20	36	677
(9) ICW 317	—	—	274	—	53	433	—	—	—	—	10	770
(10) ICW 418	—	—	257	—	—	4	—	—	—	—	92	353
(11) ICW 419	—	—	267	—	—	—	—	—	—	9	95	371
(12) ICW 503	—	9	329	—	—	54	—	34	60	31	69	586
(13) ICW 218	—	—	192	—	4	88	—	46	75	109	55	569
(14) ICW 318	—	—	147	—	20	98	—	22	—	49	31	367
(15) ICW 118	—	—	122	—	—	32	—	—	—	—	26	180
(16) ICW 219	—	—	149	—	55	168	—	13	3	129	91	608
(17) ICW 319	—	—	259	—	—	44	—	6	—	18	—	327
(18) ICW 220	—	—	—	—	44	—	—	—	—	44	245	333
(19) ICW 221	—	—	210	—	20	58	—	—	67	15	—	370
(20) ICW 320	—	—	275	—	—	54	—	44	92	9	30	504
(21) ICW 322	—	—	403	—	—	—	—	—	270	18	—	691
(22) ICW 422	—	—	115	—	1	—	35	6	—	—	101	258
(23) ICW 222	—	—	140	—	—	189	—	—	—	52	54	435
(24) ICW 223	—	—	336	—	38	63	—	—	87	12	—	536
(25) ICW 424	—	10	30	—	—	7	—	—	39	—	139	225
(26) ICW 224	—	—	365	—	38	152	—	—	65	49	55	724
(27) ICW 325	—	—	458	—	65	185	—	—	134	53	9	904
(28) ICW 124	6	3	96	—	—	—	3	—	11	—	51	170
(29) ICW 125	4	8	188	—	—	77	—	—	33	—	54	364
(30) ICW 126	—	—	44	—	—	—	—	—	34	—	10	88
(31) ICW 226	—	—	282	—	—	—	—	—	149	35	—	466
(32) ICW 227	—	—	253	—	19	210	—	18	9	38	—	547
(33) ICW 327	—	—	256	—	38	14	—	—	535	36	5	884
(34) ICW 427	—	—	96	—	—	6	—	—	62	—	114	278
(35) ICW 228	—	—	192	—	63	8	—	—	206	32	10	511
(36) ICW 329	—	—	474	—	57	—	—	—	281	22	—	834
(37) ICW 429	—	—	321	—	—	—	—	—	159	—	2	482
(38) ICW 230	—	—	164	—	—	71	—	—	61	—	359	655
(39) ICW 331	—	—	10	—	130	—	—	—	766	—	—	906
(40) ICW 431	—	—	17	—	—	2	—	—	283	—	15	317
(41) ICW 131	—	23	127	—	—	9	—	—	130	—	67	356

TABLE B-1

Habitat Characteristics (Acres) of the Lake Red Rock Fee Area (Page 2 of 3)

Compartment	PR*	GR	AG	PL	DE	BR	SA	MA	FB	WE	DF	TOTAL
(42) ICW 232	—	—	229	—	—	20	—	—	169	—	236	654
(43) ICW 333	—	—	—	—	67	—	—	—	569	193	—	829
(44) ICW 432	—	—	164	—	—	18	—	8	239	8	12	449
(45) ICW 517	—	8	—	—	—	—	—	—	25	—	28	61
(46) ICW 233	—	5	74	—	—	1	—	—	181	—	99	360
(47) ICW 234	—	—	—	—	—	—	3	—	102	—	12	117
(48) ICW 335	—	—	—	—	205	—	—	—	174	121	—	500
(49) ICW 434	—	—	25	—	—	5	—	—	108	159	156	453
(50) ICW 323	—	—	306	—	—	—	—	—	92	16	—	414
(51) ICW 336	3	—	—	—	131	10	—	5	294	276	26	745
(52) ICW 327	—	—	256	—	38	14	—	—	535	36	5	884
(53) ICW 436	—	9	4	—	—	7	—	3	39	—	73	135
(54) ICW 440	6	4	54	—	—	—	6	6	—	—	38	114
(55) ICP 438	12	49	6	—	113	16	162	60	136	—	397	961
(56) ICP 237	—	15	1	—	—	46	38	113	301	—	226	740
(57) MCP 240	3	45	179	6	311	7	85	85	151	13	434	1,346
(58) COE 135	—	—	24	3	—	5	73	—	2	—	5	112
(59) COE 236	—	—	65	3	—	—	4	—	119	—	11	202
(60) COE 237	—	11	—	—	—	—	70	10	56	—	47	194
(61) COE 242	12	—	3	15	—	—	4	18	72	—	115	239
(62) COE 243	—	—	—	—	—	—	2	2	25	—	13	42
(63) COE 244	14	7	—	39	—	35	13	10	82	—	94	294
(64) COE 345	—	6	—	48	—	67	—	60	182	—	149	512
(65) COE 348	2	10	—	61	—	7	36	53	110	—	93	372
(66) COE 448	20	—	4	119	46	16	71	206	—	42	141	665
(67) COE 446	6	2	—	103**	—	11	8	27	164	—	121	442
(68) COE 445	—	—	—	34	—	—	10	—	27	—	49	1[illegible]
(69) COE 443	6	—	—	21	—	—	5	97	79	—	87	[illegible]95
(70) COE 611	—	2	53	28	—	—	68	—	355	—	83	589
(71) COE 533	13	—	—	—	6	—	5	6	—	—	8	38
(72) COE 613	—	—	—	—	—	—	2	—	38	—	4	44
(73) COE 706	—	12	15	17	—	—	16	—	138	—	43	241
(74) COE 528	—	—	16	5	8	5	47	—	92	—	36	209
(75) COE 608	—	7	109	93	7	6	63	—	275	16	49	625
(76) COE 442	—	—	271	—	—	—	14	—	178	—	11	474
(77) COE 525	—	9	39	7	—	—	47	—	210	—	62	374
(78) COE 606	—	15	76	7	19	2	49	—	328	28	55	579
(79) COE 905	2	3	137	—	17	1	60	—	922	23	49	1,214
(80) COE 907	20	—	145	—	—	27	61	—	231	25	60	569
(81) COE 807	16	—	69	—	—	25	139	25	50	—	98	422
(82) COE 908	30	—	417	—	18	343	63	44	9	33	24	981

TABLE B-1

Habitat Characteristics (Acres) of the Lake Red Rock Fee Area (Page 3 of 3)

Compartment	PR*	GR	AG	PL	DE	BR	SA	MA	FB	WE	DF	TOTAL
(83) COE 108	1	2	552	—	21	10	147	—	8	8	17	766
(84) COE 522	—	1	118	3	—	—	11	28	128	—	27	316
(85) COE 521	—	10	127	18	—	2	13	—	54	—	21	245
(86) COE 447	—	—	—	—	6,953	—	—	—	261	12	—	7,226
TOTALS	176	291	12,544	630	8,788	3,045	1,500	1,100	11,038	1,913	6,078	47,103

* PR (Prairie) — Grasslands of native grasses and forbs.

GR (Grasslands) — Grasslands of where introduced prairie grasses may be present, but do not dominate the segment.

AG (Cultivated Ground) — Ground on which crops such as corn, soybeans, etc. are cultivated by farmers. Additionally ground which is cultivated and seeded to millet, clover, corn, etc. to provide food for wildlife.

PL (Forest Plantation) — Forest communities where trees have been hand planted in rows.

DE (Deepwater) — Environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live, whether or not they are attached to the substrate.

BR (Brush) — A community of plants, dominated by brush.

SA (Savanna) — Grasslands or fields with scattered trees in groups or singly. The trees do not form a closed canopy over the dominating grasslands.

MA (Man Dominated) — Areas where man has planted and maintains the vegetation such as campgrounds.

FB (Forbs/Broadleaved Herbaceous Ground Cover) — Fields or meadow of herbaceous plants other than crops or grass.

WE (Wetlands) — Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

DF (Deciduous Forest) — A forest community in which the trees and shrubs drop their leaves in the fall and grow new leaves in the spring. These species are commonly refered to as the hardwoods.

CF (Coniferous Forest) — A forest community that is characterized by coniferous or cone-bearing tree species. These species of trees are commonly refered to as evergreens and softwoods. These woods may very well be harder in composition than the deciduous species or hardwoods.

† First number is compartment number; alphanumeric code refers to management agency (see Figure _-_ for compartment locations).

** Acreage included in this area was characterized by reveiwing aerial photographs. Original habitat characterization was questionable due to typing errors.

Source: RICOE, 1983.

TABLE B-2

Habitat Characteristics (Acres) of the Lake Red Rock Easement Area (Page 1 of 4)

Aerial No.	AG*	DF	DV	GR	OF	TOTAL
1-5	309.8	161.1	6.0	--	164.0	640.9
1-7	45.0	132.0	--	--	59.0	236.0
1-10	28.9	21.8	--	1.1	19.5	71.3
1-15	82.9	49.8	--	--	7.5	140.2
1-18	200.6	9.6	--	--	14.6	224.8
1-19	154.4	42.7	--	--	98.6	295.7
1-21	3.5	7.8	--	--	17.4	28.7
1-23	1.0	8.2	--	32.0	1.0	42.2
1-24	86.1	32.0	--	--	--	118.1
1-25	190.0	10.6	2.5	23.5	55.0	281.6
1-26	264.4	8.5	--	--	22.8	295.7
1-27	193.0	10.3	--	--	10.3	213.6
1-29	29.1	8.9	--	17.4	9.2	64.6
1-31	49.1	42.7	--	264.3	27.7	383.8
1-33	11.4	7.1	--	--	6.8	25.3
1-34	64.7	4.6	--	46.6	15.6	131.5
1-36	14.2	9.6	--	--	--	23.8
1-37	1.4	3.2	--	--	--	4.6
1-38	30.2	44.1	--	15.3	19.9	109.5
1-39	9.6	20.3	--	1.0	6.0	36.9
1-40	6.8	17.0	--	2.1	--	25.9
1-43	6.4	--	--	--	12.8	19.2
2-5	377.1	9.9	--	--	2.8	389.8
2-7	131.6	--	--	--	38.1	169.7
2-8	412.5	49.8	--	--	--	462.3
2-9	320.2	82.2	--	--	24.9	427.3
2-10	422.0	7.1	--	--	1.0	430.1
2-11	234.1	--	--	--	256.2	490.3
2-12	359.7	59.4	--	--	78.2	309.2
2-13	180.5	50.5	--	--	78.2	309.2
2-14	83.9	23.5	--	--	20.6	128.0
2-15	220.9	7.8	--	--	27.7	256.4
2-16	615.8	--	--	--	148.4	764.2
2-17	159.7	--	--	--	116.3	276.0
2-18	173.2	5.3	87.1	--	70.0	335.6
2-19	197.4	--	--	--	303.2	500.6
2-20	--	--	--	--	119.2	119.2
2-21	--	39.8	--	--	54.7	94.5
2-28	12.5	8.5	--	--	20.9	41.9
2-29	--	--	--	--	12.4	12.4

TABLE B-2

Habitat Characteristics (Acres) of the Lake Red Rock Easement Area (Page 2 of 4)

Aerial No.	AG*	DF	DV	GR	OF	TOTAL
2-30	22.1	7.4	—	61.2	—	90.7
2-32	16.4	4.3	—	—	1.8	22.5
2-33	10.3	—	—	—	13.8	24.1
2-35	36.3	26.7	9.6	42.3	7.1	122.0
2-36	11.3	2.5	—	—	6.4	20.2
2-37	23.4	18.8	—	85.7	16.0	143.9
2-39	8.9	3.5	—	6.8	—	19.2
2-40	4.6	5.3	—	6.4	—	16.3
2-42	11.3	15.3	3.5	18.8	—	48.9
2-43	6.8	18.8	2.8	28.0	9.9	66.3
2-44	43.4	4.2	—	21.0	3.9	72.5
2-45	3.9	9.3	—	17.0	18.8	48.9
2-46	8.2	21.6	7.4	—	44.0	81.2
3-6	95.7	—	5.3	—	—	101.0
3-7	27.6	27.0	—	—	2.4	57.0
3-8	455.5	17.4	—	—	1.0	473.9
3-9	567.1	140.0	—	—	—	707.1
3-10	401.0	83.6	—	—	—	484.6
3-11	446.9	301.0	—	119.2	—	867.1
3-12	314.1	59.5	—	—	44.2	417.8
3-18	10.3	—	—	—	38.0	48.3
3-19	83.2	—	—	—	25.6	108.8
3-27	23.4	—	—	—	—	23.4
3-28	—	—	—	58.7	—	58.7
3-37	7.8	2.8	—	—	—	10.6
3-38	—	—	—	60.4	—	60.4
3-48	—	—	—	—	9.9	9.9
4-6	226.2	95.3	7.1	—	10.6	339.2
4-8	21.6	20.2	—	—	2.4	44.2
4-9	53.4	10.6	12.8	—	5.3	82.1
4-10	245.5	71.5	—	—	11.6	328.6
4-11	204.0	41.9	—	—	10.6	256.5
4-12	147.0	52.7	—	—	—	199.7
4-13	—	10.0	—	—	3.9	13.9
4-14	36.2	5.3	—	—	33.8	75.3
4-15	—	6.4	—	—	—	6.4
4-17	25.5	1.4	—	—	15.6	42.5
4-18	180.7	5.0	—	—	64.0	249.7
4-19	230.2	21.6	3.5	—	79.4	334.7
4-21	3.2	6.4	1.4	—	6.0	17.0

TABLE B-2

Habitat Characteristics (Acres) of the Lake Red Rock Easement Area (Page 3 of 4)

Aerial No.	AG*	DF	DV	GR	OF	TOTAL
4-22	4.2	2.4	---	---	5.6	12.2
4-24	5.6	5.7	---	---	34.8	46.1
4-25	---	9.6	---	2.8	---	12.4
4-26	---	9.6	---	9.9	2.8	22.3
4-27	9.9	12.8	---	---	3.2	25.9
4-29	110.6	23.8	---	11.3	4.5	150.2
4-31	37.0	18.8	---	109.9	26.6	192.3
4-32	14.9	40.9	---	12.0	9.2	77.0
4-34	---	3.5	---	---	10.3	13.8
4-36	---	20.6	---	3.2	7.8	31.6
4-41	117.4	---	---	---	9.9	127.3
5-1	197.4	---	---	---	---	197.4
5-2	322.0	7.8	---	---	3.5	333.3
5-3	3.9	7.1	2.4	---	3.9	17.3
5-4	159.0	22.0	---	---	14.9	195.9
5-13	2.8	2.8	---	---	---	5.6
5-14	95.3	11.3	---	---	76.5	183.1
5-16	11.7	6.4	---	---	16.3	34.4
5-17	7.8	2.1	---	---	137.3	47.2
5-20	2.5	---	---	27.7	1.4	31.6
5-21	64.4	---	---	---	33.4	97.8
5-22	50.9	30.6	---	3.9	8.9	94.3
5-25	24.9	5.0	---	---	8.8	38.7
5-26	11.0	18.1	---	---	2.8	31.9
5-27	---	0.7	---	2.1	1.0	3.8
5-28	2.4	3.9	---	---	10.6	16.9
5-29	3.5	3.5	4.2	---	4.06	51.8
5-30	6.7	12.8	---	---	40.9	60.4
5-32	3.5	9.6	---	---	10.3	23.4
6-2	18.8	16.0	---	---	37.0	71.8
6-6	7.4	5.6	---	---	12.3	25.3
6-8	14.2	1.7	---	---	8.1	24.0
6-9	25.2	3.2	---	---	29.5	57.9
6-10	25.2	3.2	---	---	12.8	41.2
6-11	9.2	23.4	---	---	43.4	76.0
7-2	5.6	1.7	---	---	10.3	17.6
7-5	15.3	37.0	---	---	13.0	65.3
7-6	3.2	3.5	---	7.4	42.9	57.0
8-5	5.3	3.9	---	---	27.3	36.5
8-7	16.7	11.3	---	---	6.0	34.0

TABLE B-2

Habitat Characteristics (Acres) of the Lake Red Rock Easement Area (Page 4 of 4)

Aerial No.	AG*	DF	DV	GR	OF	TOTAL
8-8	4.2	3.5	—	—	2.4	10.1
9-2	8.5	5.3	—	—	32.3	46.1
9-3	—	—	—	—	27.7	27.7
9-5	6.0	—	—	10.6	34.1	50.7
9-6	51.2	—	—	—	—	51.2
9-7	302.8	—	—	—	1.4	304.2
9-8	25.2	2.1	—	—	19.2	46.5
9-9	29.1	9.2	—	—	3.9	42.2
9-11	67.6	13.8	—	—	93.5	174.9
10-3	—	—	—	4.6	13.5	18.1
10-4	—	13.5	—	—	1.7	15.2
10-5	38.0	15.6	—	13.8	15.3	82.7
10-7	21.3	22.4	—	—	10.3	54.0
10-8	8.8	21.7	12.8	—	30.6	73.9
10-9	80.7	—	—	—	—	80.7
10-10	193.2	11.7	—	—	50.5	255.4
11-1	7.8	2.1	—	23.4	—	33.3
11-8	23.4	8.8	—	—	20.2	52.4
11-10	19.5	8.5	—	—	3.5	31.5
White Breast Creek†	819.0	347.2	—	—	27.2	1,203.4
Middle Creek†	658.7	248.4	0.6	—	30.1	937.8
South Creek†	2,244.0	478.2	—	—	223.8	2,946.0
TOTAL	16,368.5	3,749.5	169.0	1,171.4	3,864.7	25,323.1

*AG (Agricultural Land) - Ground on which crops are cultivated by farmers.
DF (Deciduous Forest) - A forest community in which the trees and shrubs drop their leaves in the fall and grow new leaves in the spring.
DV (Developed Land) - Man dominated areas where individual dwellings, cities, industrial buildings, and other permanent structures are maintained.
GR (Grasslands) - Areas of native and introduced grasses and forbs.
OF (Oldfields) - Fields or meadows of hebaceous plants (including areas of brush and scattered trees), other than grasslands or crops.

†Additional coverage beyond flight lines 1-11 provided by USDA ASCS.

Source: ESE. 1986.

TABLE B-3

Terrestrial Communities Within the Lake Red Rock Project Area (Page 1 of 3)

Habitat Type	Vegetation Characteristics	Distribution
Forest		
Upland		
Maple-Basswood Community	Dominant: Sugar maple, Basswood, Hophornbeam Common: Shag-bark hickory, Mockernut hickory, White oak, American elm, Black oak	Primarily on mesic north facing slopes
Oak-Hickory Community	Dominants: White oak, Red oak, Black oak, Bar oak, Hophornbeam, Shag-bark hickory Common: American elm, Dogwood	Dry ridges and south or west facing slopes
Bottomland	Dominant: Silver maple, Boxelder, Red mulberry, American elm, Hackberry Common: Black walnut, Mockernut hickory	Des Moines River flood-plain; upper areas and coves of Lake Red Rock

TABLE B-3

Terrestrial Communities Within the Lake Red Rock Project Area
(Page 2 of 3)

Habitat Type	Vegetation Characteristics	Distribution
Oldfield/Savanna	Herbaceous: Grasses Asters Goldenrods Whorled rosinweed Ragweeds White snakeroot Evening primrose Non-Herbaceous (Shrubs): Rose Red cedar Grape Silver maple	Widely distributed; primarily in abandoned agricultural and pasture lands, railroad rights-of-way and areas of recent physical disturbance.
Wetlands	Emergent: Cattails Arrowhead Mudflat/Bar Areas: Silver maple Black willow Sandbar willow Smartweed Pigweed	Stable pools around Lake Red Rock; isolated pockets along Des Moines River; isolated farm ponds within project area.
Developed	Cultivares, maintained as lawns, landscapes, etc.	Roadways, urban, suburban areas, recreational areas.
Grassland	Native (Prairie) Vegetation: Big bluestem Indian grass Yellow cone flower Purple priarie clover Non-Native Vegetation:	Remnants restored and maintained on Corps-owned land.

TABLE B-3

Terrestrial Communities Within the Lake Red Rock Project Area
(Page 3 of 3)

Habitat Type	Vegetation Characteristics	Distribution
Agricultural	Row Crop: corn, soybeans Other Crops: oats, alfalfa, timothy Livestock: Feed lots	Primarily at upper elevations within the project area (Easement Zone); primarily in crop land.

Source: ESE, 1986.

TABLE B-4

Abundance and Habitat Preferences of Mammals Known or Expected to Occur Along the Lake Red Rock Project Area (Page 1 of 4)

Common Name	Scientific Name	Abundance and Preferred Habitat	Comments
	Didelphidae		
Virginia opossum	Didelphis virginiana	Abundant; disturbed areas of lower elevations.	
	Soricidae		
Short-tailed shrew	Blarina brevicauda	Abundant; forests, brush, and grasslands.	
Least shrew	Cryptotis parva	Fairly common; less often observed in the eastern half of the state; undistrubed grassy areas.	
Masked shrew	Sorex cinereus	Rare; moist situations.	
	Talpidae		
Common mole	Scalopus aquaticus	Abundant; dry, sandy soils.	
	Vespertilionidae		
Little brown bat	Myotis lucifugus	Common in caves, buildings and trees.	
Keen's bat	Myotis keenii	Uncertain; scarce and local in caves throughout the state.	
Indiana bat	Myotis sodalis	Associated with major cavernous limestone areas. Migratory throughout the Midwest.	Collected at Lake Red Rock near North Overlook (Bowles, 1984)
Silvered-haired bat	Lasionycteris noctivagens	Rare, present only in the winter and during migratory periods; buildings	
Eastern pipistrelle	Pipistrellus subflavus	~~Abundant at lower elevations~~; trees, caves, buildings	
Big brown bat	Eptesicus fuscus	Abundant especially in buildings	
Red bat	Lasiurus borealis	Abundant; trees, occasionally caves	

TABLE B-4

Abundance and Habitat Preferences of Mammals Known or Expected to Occur Along the Lake Red Rock Project Area (Page 2 of 4)

Common Name	Scientific Name	Abundance and Preferred Habitat	Comments
Hoary bat	Lasiurus cinereus	Rare; woods.	
Evening bat	Nycticeious humeralis	Uncertain; probably present only during summer in buildings and hollow trees.	Very unlikely to occur; extreme edge of ra-
	Leporidae		
White-tailed jack rabbit	Lepus townsendi	Abundant in all habitats but prefers brushlands.	
Eastern cottontail	Sylvilagus floridanus	Abundant in all habitats but prefers brushlands.	
	Sciuridae		
Thirteen-lined ground squirrel	Citellus tridecemlineatus	Common; prairies.	
Franklin's ground squirrel	Citellus franklini	Uncommon; borders of fields, open woods and marshes.	
Eastern chipmunk	Tamias striatus	Common locally; rocky and forested areas.	
Woodchuck	Marmota monax	Uncommon; more often seen in the eastern half of the state; open woods, forest margins, rocky outcrops.	
Grey squirrel	Sciurus carolinensis	Common; hardwood forests, bottomland.	
Fox squirrel	Sciurus niger	Fairly common; open woodlands.	
Southern flying squirrel	Glaucomys volans	Fairly common; hardwood forests.	
	Castoridae		
Beaver	Castor canadensis	Fairly common; tree-lined streams and creeks.	

TABLE B-4

Abundance and Habitat Preferences of Mammals Known or Expected to Occur Along the Lake Red Rock Project Area (Page 3 of 4)

Common Name	Scientific Name	Abundance and Preferred Habitat	Comments
	Geomyidae		
Plans pocket gopher	Geomys bursarius	Common; sandy areas.	
	Cricetidae		
Western harvest mouse	Reithrodontomys megalotis	Uncommon; abandoned fields.	
Deer mouse	Peromyscus maniculatus	Uncertain; all habitats.	
White-footed mouse	Peromyscus leucopus	Abundant; all areas with adequate cover.	
Meadow vole	Microtus pennsylvanicus	Abundant; grasslands and swamps.	
Prairie vole	Microtus ochrogaster	Prairies and grasslands.	
Pine Vole	Microtus pinetorum	Common to abundant; forests and grasslands with loose soils.	
Muskrat	Ondatra zibethicus	Abundant in marshes, streams and ponds.	
Southern bog lemming	Synaptomys cooperi	Uncommon; dense bluegrass.	
	Muridae		
Norway rat	Rattus norvegicus	Common; stores and houses.	
House mouse	Mus musculus	Common; buildings and oldfields.	
	Zapodidae		
Meadow jumping mouse	Zapus hudsonius	Probably uncommon; grasslands.	
	Canidae		
Red fox	Vulpes vulpes	Common; cultivated lands and forest margins.	
Gray fox	Urocyon cinereoargenteus	Rare; brush and wooded habitats.	
Coyote	Canis latrans	Common; variety of habitats.	

TABLE B-4

Abundance and Habitat Preferences of Mammals Known or Expected to Occur Along the Lake Red Rock Project Area (Page 4 of 4)

Common Name	Scientific Name	Abundance and Preferred Habitat	Comments
	Procyonidae		
Raccoon	<u>Procyon lotor</u>	Abundant; most habitats, but more commonly woodlands.	
	Mustelidae		
Long-tailed weasel	<u>Mustela frenata</u>	Fairly common; most areas near water.	
Least weasel	<u>Mustela rixosa</u>	Rare; woods and fields.	
Mink	<u>Mustela vison</u>	Common; streams, lakes and rivers.	
Badger	<u>Taxidea taxus</u>	Rare; grasslands.	
River otter	<u>Lutra canadensis</u>	Rarely observed, if present; along mud banks and in vegetated clearer waters.	Introduced into the project area in 1985.
Striped skunk	<u>Mephitis mephitis</u>	Common; brush and grasslands.	
Spotted skunk	<u>Spilogale interrupta</u>	Common; brushy or sparsely wooded areas, along streams and prairies.	
	Cervidae		
White-tailed deer	<u>Odocoileus virginianus</u>	Fairly common; woods, brush, forest margins.	

Sources: Polder, 1953.
Schwartz, 1975.
Chapman and Feldhammer, 1982.

TABLE B-5

Avian Species Which are Common or Abundant in those Habitats Bordering the Lake Red Rock Project Area (Page 1 of 4)

Common Name	Scientific Name
Common loon	Gavia immer
Pied-billed grebe	Polilymbus podiceps
Double-crested cormorant	Phalacrocorax auritus
Great blue heron	Ardea herodias
Green heron	Butorides virescens
Canada goose	Branta canadensis
Snow goose	Chen caerulescens
Mallard	Anas platyrhynchos
Black duck	Anas rubripes
Pintail	Anas acuta
Bluewinged teal	Anas discors
American widgeon	Mareca americana
Schoveler	Spatula clypeata
Wood duck	Aix sponsa
Ring-necked duck	Aythya collaris
Redhead	Aythya americana
Lesser scaup	Aythya affinis
Common goldeneye	Bucephala clangula
Bufflehead	Bucephala albeola
Ruddy duck	Oxyura jamaicensis
Hooded merganser	Lophodytes cucullatus
Common merganser	Mergus mersanser
Cooper's hawk	Accipiter cooperi
Red-tailed hawk	Buteo jamaicensis
Red-shouldered hawk	Buteo lineatus
Broad-winged hawk	Buteo platypterus
Bald eagle	Haliaeetus leucocephalus
Marsh hawk	Circus cyaneus
American kestrel	Falco sparverius
Bobwhite	Colinus virginianus
Ring-necked pheasant	Phasianus colchicus
Virginia rail	Rallus limicola
Sora	Porzana carolina
American coot	Fulica americana
Killdeer	Charadrius vociferus
Common snipe	Capella gallinago
Spotted sandpiper	Actitis macularia
Solitary sandpiper	Tringa solitaria
Greater yellowlegs	Totanus melanoleucus
Lesser yellowlegs	Totanus flavipes
Pectoral sandpiper	Erolia melanotus

TABLE B-5

Avian Species Which are Common or Abundant in those Habitats Bordering the Lake Red Rock Project Area (Page 2 of 4)

Common Name	Scientific Name
Pectoral sandpiper	Erolia melanotus
Least sandpiper	Erolia minutilla
Semipalmated sandpiper	Ereuhetes pusillus
Herring gul	Larus argentatus
Ring-billed gull	Larus delawarensis
Forsters tern	Sterna forsteri
Black tern	Chlidonias niger
Rock dove	Columba livia
Mourning dove	Zenaida macroura
Yellow-billed cuckoo	Coccyzus americanus
Black-bill cuckoo	Coccyzus erythropthalmus
Great horned owl	Bubo virginianus
Schreech owl	Otus asio
Common nighthawk	Chordeiles minor
Chimney swift	Chaetura pelagica
Ruby-throated hummingbird	Archilochus colubris
Belted kingfisher	Megaceryle alcyon
Common flicker	Colaptes auratus
Red-bellied woodpecker	Centurus carolinas
Red-headed woodpecker	Melanerpes erythrocephalus
Yellow-bellied sapsucker	Sphyrapicus varius
Hairy woodpecker	Dendrocopus villosus
Downy woodpecker	Dendrocopus pubescens
Eastern kingbird	Tyrannus tyrannus
Great-crested flycatcher	Myiarchus crinitus
Eastern phoebe	Sayornus phoebe
Yellow-bellied flycatcher	Empidonax flaviventris
Acadian flycatcher	Empidonas virescens
Least flycatcher	Empidonax minimus
Eastern wood peewee	Contopus virens
Horned lark	Eremophila alpestris
Bank swallow	Riparia riparia
Rough-winged swallow	Stelgidopteryx ruficollis
Barn swallow	Hirundo rustica
Purple martin	Progne subis
Blue jay	Cyanocitta cristata
Common crow	Corvus brachyrhynchos
Black-capped chickadee	Parus atricapillus
Tufted titmouse	Parus bicolor
White-breasted nuthatch	Sitta carolinensis
Brown creeper	Certhis familiaris

TABLE B-5

Avian Species Which are Common or Abundant in those Habitats Bordering the Lake Red Rock Project Area (Page 3 of 4)

Common Name	Scientific Name
House wren	Troglodytes aedon
Winter wren	Troglodytes troglodytes
Bewick's wren	Thryomanes bewickii
Carolina wren	Thryothorus ludovicianus
Long-billed marsh wren	Telmatodytes palustris
Catbird	Dumetella carolinensis
Brown thrasher	Toxostoma rufum
Robin	Turdus migratorius
Wood thrush	Hylocichla mustelina
Swainson's thrush	Hylocichla ustulata
Gray-cheeked thrush	Hylocichla minima
Veery	Hylocichla fuscescens
Eastern bluebird	Sialia sialis
Golden-crowned kinglet	Regulus satraps
Ruby-crowned kinglet	Regulus calendula
Cedar waxwing	Bombycilla cedrorum
Starling	Sturnus vulgaris
Yellow-throated vireo	Vireo flavifrons
Solitary vireo	Vireo solitarius
Red-eyed vireo	Vireo olivaceus
Warbling vireo	Vireo gilvus
Black-and-white warbler	Mniotilta varis
Prothonotary warbler	Protonotaria citrea
Tennessee warbler	Vermivora peregrina
Nashville warbler	Vermivora ruficapilla
Yellow warbler	Dendroica petechia
Magnolia warbler	Dendroica magnolia
Yellow-rumped warbler	Dendroica coronata
Black-throated green warbler	Dendroica virens
Yellow-throated warbler	Dendroica dominica
Chestnut-sided warbler	Dendroica pennsylvanica
Blackpoll warbler	Dendroica striata
Palm Warbler	Dendroica palmarum
Ovenbird	Seiurus aurocapillus
Northern waterthrush	Seiurus noveboracensis
Louisiana waterthrush	Seiurus motacilla
Yellowthroat	Geothlypis trichas
Yellow-breasted chat	Icteria virens
Wilson's warbler	Wilsonia pusilla
American redstart	Setopnaga ruticilla
House sparrow	Passer domesticus

TABLE B-5

Avian Species Which are Common or Abundant in those Habitats Bordering the Lake Red Rock Project Area (Page 4 of 4)

Common Name	Scientific Name
Bobolink	*Dolichonyx oryzivorus*
Eastern meadolark	*Sturnella magna*
Redwing blackbird	*Agelaius phoeniceus*
Baltimore oriole	*Icterus gabula*
Common grackle	*Quiscalus quiscula*
Rusty blackbird	*Euphagus carolinus*
Brown-headed cowbird	*Molthrus ater*
Cardinal	*Richmondena cardinalis*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Indigo bunting	*Passerina cyanea*
Dickcissel	*Spiza americana*
Purple finch	*Carpodacus purpureus*
American goldfinch	*Spinus tristis*
Rufous-sided towhee	*Pipilo erythrophthalmus*
Savannah sparrow	*Passerculus sandwichensis*
Grasshopper sparrow	*Ammodramus savannarum*
Vesper sparrow	*Pooecetes gramineus*
Lark sparrow	*Chondestes grammacus*
Dark-eyed junco	*Junco hyemalis*
Tree sparrow	*Spizella arborea*
Chipping sparrow	*Spizella passerina*
Field sparrow	*Spizella pusilla*
White-throated sparrow	*Zonotrichia albicollis*
Fox sparrow	*Paiserella iliaca*
Lincoln's sparrow	*Melospiza lincolnii*
Swamp sparrow	*Melospiza georgina*
Song sparrow	*Melospiza melodia*

Source: ESE, 1986.

TABLE B-6

Habitat Preferences of Amphibians and Reptiles Known or Expected to Occur in the Lake Red Rock Project Area (Page 1 of 4)

Common Name	Scientific Name	Preferred Habitat	Comments
	Amphibia		
Mudpuppy	Necturus maculosa	Ponds, lakes, streams, and rivers.	
	Ambystomatidae		
Small-mouthed salamander	Ambystoma texanum	Debris in ponds, swamps, and lakes.	Uncommon, edge of range.
Tiger salamander	Ambystoma tigrinum	Moist environments.	
	Salamandridae		
Central newt	Notopthalmus viridescens	Permanent and semi-permanent bodies of water in early stages; later seen occasionally on land.	
	Bufonidae		
American toad	Bufo americanus	Most moist habitats.	
	Hylidae		
Spring peeper	Hyla crucifer	Near streams, creeks and ponds in forests.	
Gray treefrog	Hyla versicolor and Hyla chrysoscelis	Moist wooded areas.	
Chorus frog	Pseudacris triseriata	Grasslands and farmlands.	
Cricket frog	Acris crepitans	Edges of ponds, lakes and intermittent streams.	
	Ranidae		
Green frog	Rana clamitans	Creeks, ponds, streams.	
Bullfrog	Rana catesbeiana	Larger bodies of water including lakes, ponds, slow-moving streams.	
Northern leopard frog	Rana pipiens	Shallow-water habitats.	
Pickerel frog	Rana palustris	Swamps, streams, ravines.	

TABLE B-6

Habitat Preferences of Amphibians and Reptiles Known or Expected to Occur in the Lake Red Rock Project Area (Page 2 of 4)

Common Name	Scientific Name	Preferred Habitat	Comments
	Chelydridae		
Snapping turtle	Chelydra serpentina	Lakes and ponds.	
	Testudinidae		
Painted turtle	Chrysemys picta	Marshes, ponds, swamps, drainage ditches.	
Map turtle	Graptemys geographica G. pseudogeographica	Lakes and rivers. Lakes and rivers.	
Blanding's turtle	Emydoidea blandingi	Pond and lakes.	
	Chelonidae		
Smooth softshell	Trionyx muticus	Creeks, streams, rivers and occasionally lakes.	
Spiny softshell	Trionyx spiniferus	Rivers and ponds.	
	Anguidae		
Slender glass lizard	Ophisaurus attenuatus	Dry grasslands and open woodlands.	
	Colubridae		
Northern water snake	Nerodia natrix sipedon	Marshes, swamps, ponds, creeks and lakes.	
Graham's water snake	Regina natrix grahami	Margins of ponds and streams.	
Red-bellied snake	Storeria occipitomaculata	Open forests.	
Brown snake	Storeria dekayi	Marshes, swamps and upland woodlands.	

TABLE B-6

Habitat Preferences of Amphibians and Reptiles Known or Expected to Occur in the Lake Red Rock Project Area (Page 3 of 4)

Common Name	Scientific Name	Preferred Habitat	Comments
Garter snake	Thamnophis sirtalis	Meadows, swamps, grasslands and woodlands.	
Smooth earth snake	Virginia valeriar	Fields, deciduous forests.	Isolated occurrence in southern Iowa.
Ribbon snake	Thamnophis sauritus	Vegetated edges of swamps, sloughs, and creeks.	
Eastern hognose snake	Heterodon platyrhinos	Open, sandy areas.	Uncommon, edge of range.
Ringneck snake	Diadophis punctatus	Rocks and logs in wooded habitats.	
Blue racer	Coluber constrictor	Forest and brush edge habitats and grasslands.	
Smooth green snake	Opheadrys vernalis	Dense woody undergrowth of forests	Isolated occurrence in southeast Iowa.
Black rat snake	Elaphe obsoleta	Vareity of areas from farmlands to woods.	
Fox snake	Elaphe vulpina	Farmlands, prairies, stream valleys and woods.	
Bull snake	Pitaophis melanoleucus	Variety of areas from farmlands to woodlands.	
Milk snake	Lampropeltis triangulum	Grasslands and cultivated fields.	
Prairie kingsnake	L. calligaster	Open woods, savannahs, prairie and pastures.	
Speckled kingsnake	L. getulus	Most habitats but more common near creeks and streams.	

TABLE B-6

Habitat Preferences of Amphibians and Reptiles Known or Expected to Occur in the Lake Red Rock Project Area (Page 4 of 4)

Common Name	Scientific Name	Preferred Habitat	Comments
	Veperidae		
Massasauga	Sistrurus catenantus	Wet prairies, swamps and bogs.	
Timber rattlesnake	Crotalus horridus	Timbered areas.	

Source: Conant, 1975.

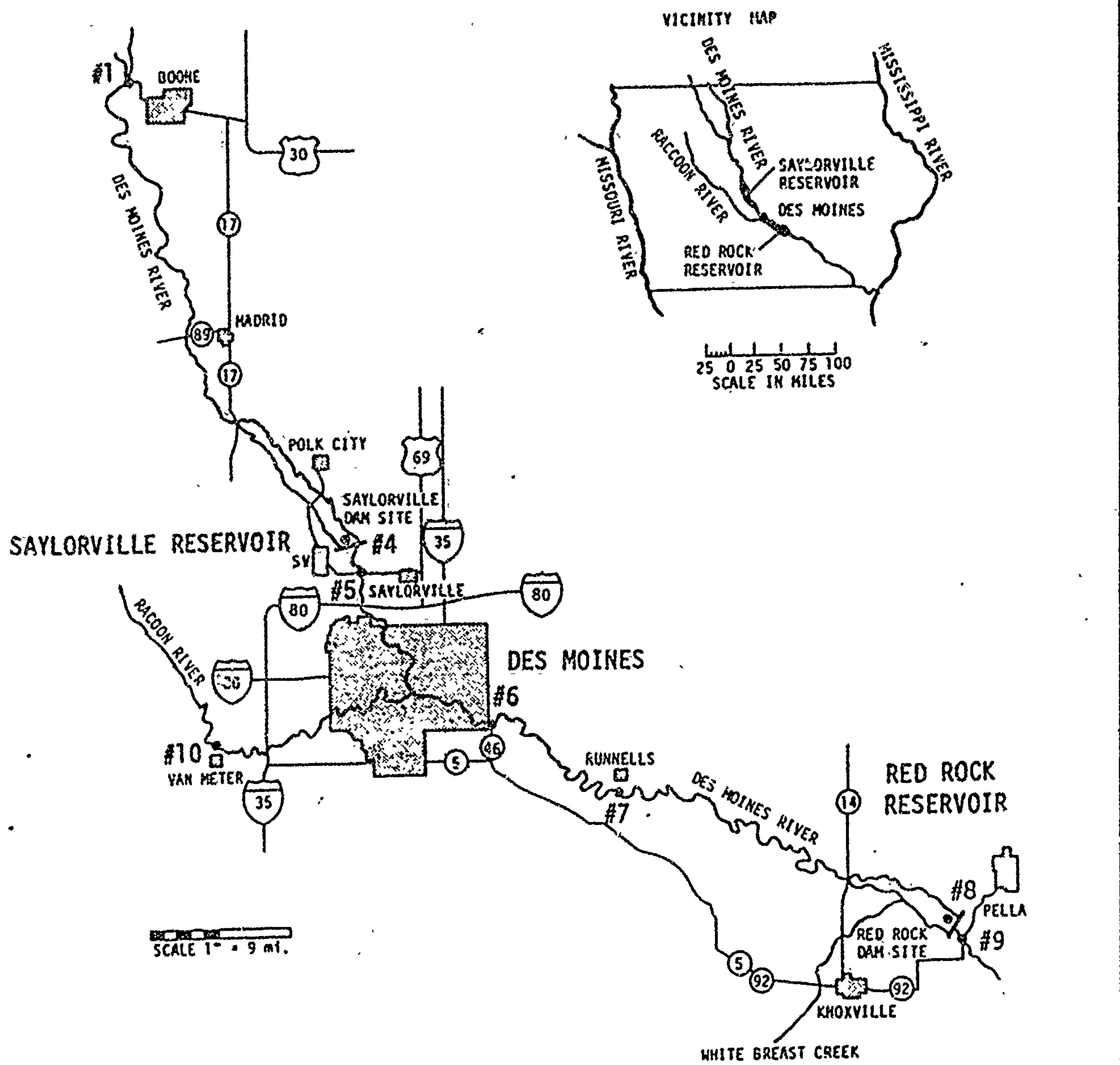
SURFACE WATER QUALITY

APPENDIX C

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR OPERATION AND MAINTENANCE
AT
LAKE RED ROCK, IOWA

APPENDIX C
SURFACE WATER QUALITY

TABLE OF CONTENTS



SOURCE: IOWA STATE UNIVERSITY, ENGINEERING RESEARCH INSTITUTE.
~~ANNUAL REPORTS (1982, 1983, 1985, 1986)~~
WATER QUALITY STUDIES - RED ROCK AND SAYLORVILLE RESERVOIRS, DES MOINES RIVER, IOWA

FIGURE C-1
LOCATION MAP FOR SAMPLING POINTS ON DES MOINES RIVER, RACCOON RIVER, SAYLORVILLE AND RED ROCK RESERVOIRS

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

TABLE C-1

Summary of Recent Dissolved Oxygen (mg/l) Values for Lake Red Rock and the Des Moines River

Station		1982	1983	1984	1985
7	Range	6.40-16.30	4.00-14.00	3.03-15.30	5.20-13.90
	Mean	12.31	9.47	10.64	9.71
8S	Range	5.55-19.55	2.70-14.30	3.65-21.60	4.40-12.50
	Mean	10.74	8.85	10.04	8.87
8M	Range	4.70-17.20	3.45-12.20	1.15-11.75	3.00-12.40
	Mean	9.88	7.69	6.77	8.11
8B	Range	0.23-16.55	0.20-11.95	0.15-10.95	0.30-10.90
	Mean	8.43	6.51	4.53	6.64
9	Range	5.20-18.73	4.80-17.60	5.25-15.20	7.95-15.85
	Mean	13.93	9.81	11.05	10.94

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs, Des Moines River, Iowa

TABLE C-2

Summary of Recent Water Temperature (°C) Data for Lake Red Rock and the Des Moines River

Station		1982	1983	1984	1985
7	Range	0.0-31.5	0-26.7	0.0-30.8	0.0-28.8
	Mean	14.4	14.4	17.6	13.9
8S		0.0-29.2	0-29.2	0.0-32.5	0.9-30.0
		17.7	18.0	21.3	18.7
8M		2.0-29.9	0-28.5	0.0-28.1	0.8-28.5
		17.7	17.3	19.7	17.7
8B		2.0-28.8	0-25.8	0.2-26.5	0.9-28.0
		17.2	16.7	18.0	16.7
9		0.0-30.0	0.7-26.0	0.0-28.9	0.1-27.7
		14.1	15.2	16.7	14.1

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs, Des Moines River, Iowa

TABLE C-3

Summary of Recent Secchi Disk (m) Values for Lake Red Rock

Station		1982	1983	1984	1985
8S	Range	0.24-0.70	0.26-1.10	0.37-4.80	0.24-1.03
	Mean	0.43	0.57	1.57	0.49

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs,
Des Moines River, Iowa

TABLE C-4

Summary of Recent Turbidity (NTU) Values for Lake Red Rock and the Des Moines River

Station		1982	1983	1984	1985
7	Range	5-6000	20-6400	3-2300	7-1100
	Mean	169	434	109	79
8S	Range	2-72	8-80	1-41	3-50
	Mean	22	35	11	20
8M	Range	2-76	22-70	1-50	3-20
	Mean	23	40	12	13
8B	Range	5-96	24-300	2-45	5-115
	Mean	36	76	22	38
9	Range	4-140	9-160	2-120	4-260
	Mean	28	52	20	29

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs, Des Moines River, Iowa

TABLE C-5

Summary of Recent Suspended Sediment Transport (1,000 kg/day)
Data for the Des Moines River Above and Below Lake Red Rock

Station		1982	1983	1984	1985
7	Range	11.15-69,460	26-242,000	60-138,316	23-112,966
	Mean	3,964	14,038	8,946	5,197
9	Range	5.822-2,814	10-5,890	28-4,577	6-13,560
	Mean	344	1,280	790	612
	% Trapment	91%	91%	91%	88.3%

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs,
Des Moines River, Iowa

TABLE C-6

Summary of Recent Chlorophyll a (mg/m^3) Values for Lake Red Rock and the Des Moines River

Station		1982	1983	1984	1985
7	Range	8-221	4-110	3-131	3-185
	Mean	56.4	29.3	33.5	38.8
8S	Range	7-154	2-41	1-274	5-53
	Mean	33.7	15.5	28.4	18.0
8M	Range	7-161	2-26	1-44	4-15
	Mean	29.8	10.7	8.9	8.8
8B	Range	2-153	1-29	1-26	4-13
	Mean	29.3	9.9	7.4	7.5
9	Range	4/163	2-39	1-66	4-37
	Mean	38.2	12.6	11.2	14.1

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs, Des Moines River, Iowa

TABLE C-7

Summary of Recent Total Phosphorus (mg/l-p) Values for Lake Red Rock and the Des Moines River

Station		1982	1983	1984	1985
7	Range	0.95-9.95	0.57-1.61	N/A	0.68-8.5
	Mean	2.53	1.07		1.81
8S	Range	0.47-2.47	0.35-0.55	N/A	0.38-1.03
	Mean	0.81	0.48		0.63
8M	Range	0.34-1.56	0.44-0.60	N/A	0.35-1.04
	Mean	0.75	0.51		0.69
8B	Range	0.36-2.25	0.57-0.66	N/A	0.39-1.29
	Mean	0.85	0.61		0.81
9	Range	0.32-2.09	0.36-0.63	N/A	0.39-1.70
	Mean	0.84	0.51		0.83

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs, Des Moines River, Iowa

TABLE C-8

Pesticide Concentrations (pptr) at Station 8, Lake Red Rock

	June 1980	July 1982
Alachlor	1000	1490
Atrazine	1180	4600
Cynazine	2380	3190
Metribuzin	N/A	260
Dachthal	20	N/A
Dicamba	<10	N/A
2,4-D	240	N/A
2,4,5-T	<10	N/A
DDE	<1	<1
DDT	N/A	2
DDD	N/A	<1
Dieldrin	9	10

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
Water Quality Studies - Red Rock and Saylorville Reservoirs, Des Moines River, Iowa

TABLE C-9

Summary of Recent Soluble Mercury Values for the Des Moines River Below Lake Red Rock

Parameter		1982 (mg/l)	1983 (mg/l)	1984 (mg/l)	1985 (mg/l)
Mercury	Range	0.14-0.68	0.0001-0.0006	0.07-0.60	<0.02-0.18
	Mean	0.41	0.0003	0.22	0.09
Lead	Range	0.01-0.03	0.01-0.03	9-26	11-32
	Mean	0.017	0.02	16.2	17.5
Chromium	Range	0.0006-0.0038	0.003	0.7-<3	<0.4-25
	Mean	0.0022	0.003	1.93	2.7
Cadmium	Range	0.001-0.004	0.001-0.003	0.7-3	<0.8-2.5
	Mean	0.003	0.002	1.52	1.6
Arsenic	Range	0.0020-0.0033	0.0019-0.0035	1.6-3.8	1.4-3.0
	Mean	0.0028	0.0024	2.28	2.29

Source: Iowa State University, Engineering Research Institute.
Annual Reports (1982, 1983, 1985, 1986)
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BOARD OF SUPERVISORS		MAHASKA COUNTY COURTHOUSE	NEW SHARON, IA.	50207	01
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BOARD OF SUPERVISORS	ATTN: DARREL GOODHUE	RURAL ROUTE	INDIANOLA, IA.	50125	01
BOARD OF SUPERVISORS	ATTN: MARVIN D. JOHNSON	HAMILTON COUNTY COURTHOUSE	STRATFORD, IA.	50249	01
BOARD OF SUPERVISORS	ATTN: RUTH HARDIN	BOX 237	INDIANOLA, IA.	50125	01
BOONE CONSERVATION BOARD	DIRECTOR	602 5TH ST.	BOONE, IA.	50220	01
BOONE HISTORICAL SOCIETY	ATTN: LARRY ADAMS	812 1/2 STORY ST.	BOONE, IA.	50036	01
COUNTY ATTORNEY		BOONE COUNTY COURTHOUSE	BOONE, IA.	50036	*
COUNTY ATTORNEY		DALLAS COUNTY COURTHOUSE	ADEL, IA.	50003	*
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COUNTY ATTORNEY		MAHASKA COUNTY COURTHOUSE	OSKALOOSA, IA.	52577	*
COUNTY ATTORNEY		MARION COUNTY COURTHOUSE	PELLA, IA.	50138	*
COUNTY ATTORNEY		POLK COUNTY COURTHOUSE	DES MOINES, IA.	50307	*
COUNTY ATTORNEY		WARREN COUNTY COURTHOUSE	INDIANOLA, IA.	50125	*
COUNTY ATTORNEY		WEBSTER COUNTY COURTHOUSE	FORT DODGE, IA.	50501	*
COUNTY CLERK		BOONE COUNTY COURTHOUSE	BOONE, IA.	50036	*
COUNTY CLERK		DALLAS COUNTY COURTHOUSE	ADEL, IA.	50003	*
COUNTY CLERK		HAMILTON COUNTY COURTHOUSE	WEBSTER CITY, IA.	50595	*
COUNTY CLERK		JASPER COUNTY COURTHOUSE	NEWTON, IA.	50208	*
COUNTY CLERK		MAHASKA COUNTY COURTHOUSE	OSKALOOSA, IA.	52577	*
COUNTY CLERK		MARION COUNTY COURTHOUSE	PELLA, IA.	50138	*
COUNTY CLERK		POLK COUNTY COURTHOUSE	DES MOINES, IA.	50307	*
COUNTY CLERK		WARREN COUNTY COURTHOUSE	INDIANOLA, IA.	50125	*
COUNTY CLERK		WEBSTER COUNTY COURTHOUSE	FORT DODGE, IA.	50501	*
COUNTY ENGINEER		DALLAS COUNTY COURTHOUSE	ADEL, IA.	50003	01
COUNTY ENGINEER		HAMILTON COUNTY COURTHOUSE	WEBSTER CITY, IA.	50595	01

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COUNTY ENGINEER		MARION COUNTY COURTHOUSE	PELLA, IA.	50138	01
COUNTY ENGINEER		WARREN COUNTY COURTHOUSE	INDIANOLA, IA.	50125	01
COUNTY ENGINEER		WEBSTER COUNTY COURTHOUSE	FORT DODGE, IA.	50501	01
COUNTY ENGINEER	BOONE COUNTY COURTHOUSE	3RD & STATE ST.	BOONE, IA.	50036	01
HAMILTON CONS. BOARD	ATTN: DEAN BERGLUND	ROUTE 1, BOX 79OURTHOUSE	STANHOPE, IA.	50246	01
JASPER CONS. BOARD DIR.		JASPER COUNTY COURTHOUSE	NEWTON, IA.	50208	01
MAHASKA CONS. BOARD DIR.		ROUTE 3, BOX 136A	NEW SHARON, IA.	50207	01
MARION CONS. BOARD DIR.		BOX 106	PELLA, IA.	50219	01
WARREN CONS. BOARD DIR.		1565 118TH AVE.	INDIANOLA, IA.	50125	01
WEBSTER CONS. BOARD DIR.		WEBSTER COUNTY COURTHOUSE	FORT DODGE, IA.	50501	01
WEBSTER COUNTY TOURISM	ATTN: MARGARET DAGLE	1721 8TH AVE. S.	FORT DODGE, IA.	50501	01
WEBSTER COUNTY TOURISM	ATTN: MILLY NETLAND	823 S. 17TH	FORT DODGE, IA.	50501	01
WEBSTER FARM BUREAU	ATTN: GORDON MARTINSON	RURAL ROUTE 1	HARCOURT, IA.	50544	01
AREA XV REG. PLAN. COMM.	ATTN: AL HUESTON, DIR.	P.O. BOX 1110	OTTUMWA, IA.	52501	01
BUREAU OF LAND MANG.	ATTN: LEON KABAT	P.O. BOX 631	MILWAUKEE, WI.	53201	01
DES MOINES RIVER CON.		WALLACE STATE OFFICE BLDG.	DES MOINES, IA.	50319	01
FIELD SUPERVISOR	ATTN: RICHARD NELSON	1830 2ND AVE. - 2ND FLOOR	ROCK ISLAND, IL.	61201	01
IA. ASSOC. SOIL CON. DIS.	ATTN: GLENN BURROWS	RURAL ROUTE 1	BRANDON, IA.	52210	01
MIDWEST NATL. TECH. CENT.	SOIL CONS. SERVICE	BOX 82503	LINCOLN, NE.	68501	01
[illegible]GIONAL ADMIN	FED. INSURANCE ADMIN.	P.O. BOX 19715	KANSAS CITY, MO.	64141	01
[illegible]IONAL DIRECTOR	U.S. FISH & WILDLIFE SER.	FORT SNELLING	TWIN CITIES, MN.	55111	01
[illegible]IONAL ENGINEER		230 S. DEARBORN ST.	CHICAGO, IL.	60604	01
[illegible]IONAL FORESTER	U.S. DEPT. OF AGRICULTURE	633 W. WISCONSIN AVE.	MILWAUKEE, WI.	53203	01
REGIONAL HYDROLOGIST.	GEOLOGICAL SURVEY	12201 SUNRISE VALLEY	RESTON, VA.	22092	01
SEC., SKUNK RIVER CON.	ATTN: DAN LINDQUIST	WALLACE STATE OFFICE BLDG.	DES MOINES, IA.	50319	01
WATER RESOURCE CENTER	ATTN: AL AUSTIN	355 TOWN ENGR. BLDG.	AMES, IA.	50010	01
WEBSTER SOIL CONS. DIST.	ATTN: DONALD SELTZ	1200 1/2 3RD AVE. NW.	FORT DODGE, IA.	50501	01
JANVRIN	HONORABLE JAMES A.	819 1ST AVE. S.	FORT DODGE, IA.	50501	01
KNOPF	GARY	CITY HALL	DAYTON, IA.	50530	01
BOONE RR. HIST. SOCIETY	ATTN: MELVIN HANSON	P.O. BOX 603	BOONE, IA.	50036	01

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RED ROCK, IOWA

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DES MOINES PARK/REC. COM.	ATTN: JAMES MUTO, PRES.	E. 1ST & LOCUST	DES MOINES, IA.	50307	01
DES MOINES PLANNING COMM.	ATTN: DICK CHRISTIAN	2810 TIFFIN	DES MOINES, IA.	50317	01
DES MOINES PLANNING COMM.	ATTN: RAY STILES	1619 E. 31ST COURT	DES MOINES, IA.	50317	01
DES MOINES PLANNING COMM.	ATTN: TOM VLASSIS	5001 LYNDALE DR.	DES MOINES, IA.	50310	01
PARK, REC., & CEM. DIR.	ATTN: JAMES DUNHAM	CITY HALL	WEBSTER CITY, IA.	50595	01
PARK, REC., & FORESTRY	ATTN: DAN PAYNE, DIR.	819 1ST AVE. S.	FORT DODGE, IA.	50501	01
PARKLAND RECREATION BOARD	ATTN: SUSAN MUELHAUPT	321 37TH ST.	DES MOINES, IA.	50312	03
PARKS & REC. DEPT.	ATTN: STEVE DRAKE	226 UNIVERSITY AVE.	DES MOINES, IA.	50311	01
STRATFORD CHAM./DEV. COR.	ATTN: DALE E. BERGMAN	1024 WASHINGTON	STRATFORD, IA.	50249	01
WEBSTER CITY DEV. CORP.	ATTN: ROBERT GRAEHWOHL	BOX 370	WEBSTER CITY, IA.	50595	01
DEAN OF LIBRARY SERVICES		IOWA STATE UNIV. LIBRARY	AMES, IA.	50010	01
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DIRECTOR	DES MOINES PUBLIC LIBRARY	1305 UNIVERSITY	DES MOINES, IA.	50314	01
DIRECTOR	DEXTER PUBLIC LIBRARY		DEXTER, IA.	50070	01
DIRECTOR	EDDYVILLE PUBLIC LIBRARY	BOX 348	EDDYVILLE, IA.	52553	01
DIRECTOR	ERIKSON PUBLIC LIBRARY	702 GREENE ST.	BOONE, IA.	50036	01
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DES MOINES REGISTER	DATEBOOK MANAGING EDITOR	715 LOCUST ST.	DES MOINES, IA.	50304	*
FORT DODGE MESSENGER	ATTN: TERRY COYLE	P.O. BOX 659	FORT DODGE, IA.	50501	*
KNOXVILLE EXPRESS	ATTN: BILL CALLAHAN	P.O. BOX 458	KNOXVILLE, IA.	50138	*
KNOXVILLE JOURNAL	MANAGING EDITOR	122 E. N. MARKET	OSKALOOSA, IA.	52577	*
MARION COUNTY NEWS	MANAGING EDITOR	144 E. MONROE	PLEASANTVILLE, IA.	50225	*
OSKALOOSA HERALD	ATTN: YVONNE SADLER	123 N. MARKET	OSKALOOSA, IA.	52577	*
THE CHRONICLE		739 FRANKLIN ST.	PELLA, IA.	50219	*
THE MESSENGER	ATTN: DELORES JOCHIMSEN	713 CENTRAL	FORT DODGE, IA.	50501	*
THE MESSENGER	ATTN: JOHN GOODLOVE	13 CENTRAL AVE., BOX 659	FORT DODGE, IA.	50501	*
THE NEWS-REPUBLICAN		812-814 KEELER ST.	BOONE, IA.	50036	*
THE REGISTER-NEWS		102 S. MAIN ST.	MADRID, IA.	50156	*
THE TRIBUNE			COLFAX, IA.	50054	*
TRI-COUNTY NEWS		111 W. MAIN ST.	ZEARING, IA.	50278	*
IPBN PUBLIC SERVICE DIR.		P.O. BOX 6450	JOHNSTON, IA.	50131	*
KCCI-TV	ATTN: KENT PETERSON	888 9TH, BOX 10305	DES MOINES, IA.	50306	*
NEWSROOM KBOE	PUBLIC SERVICE	P.O. BOX 380	OSKALOOSA, IA.	52577	*
WHO-TV 13		1801 GRAND AVE.	DES MOINES, IA.	50313	*

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KNIA RADIO STATION		P.O. BOX 31	KNOXVILLE, IA.	50138	*
KRNT RADIO STATION		BOX 1350	DES MOINES, IA.	50319	*
KIAV RADIO STATION		812-1/2 MAIN ST.	PELLA, IA.	50219	*
KVFD RADIO	ATTN: DEAN H. NAVEN	1503 4TH AVE. N.	FORT DODGE, IA.	50501	*
KWBG-KZBA RADIO	ATTN: BOB KELLEHER	P.O. BOX 366	BOONE, IA.	50036	*
KWDM-FM RADIO STATION		1101 5TH ST.	WEST DES MOINES, IA.	50265	*
KWKY RADIO STATION		BOX 662	DES MOINES, IA.	50303	*
KXJX RADIO	ATTN: MICHAEL CAIN	BOX 45	PELLA, IA.	50219	*
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BAR "G" RANCH	ATTN: FEROLD GRANT	2376 FILLMORE ST.	SWAN, IA.	50252	*
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CAPITAL SANITARY SUPPLY	ATTN: DOUGLAS IRELAND	70 COLLEGE AVE.	DES MOINES, IA.	50314	*
CNN TRANSPORTATION CO.	ATTN: M.D. NELSON	900 STORY ST.	BOONE, IA.	50036	*
COMM. ACT. RES. GROUP	ATTN: ROGER COLTON	P.O. BOX 1232	AMES, IA.	50010	*
DES MOINES POWERBOAT CLUB	ATTN: STEPHEN HOOVER	1951 ARLINGTON	DES MOINES, IA.	50314	*
DES MOINES ROWING CLUB	ATTN: JEFFREY DODGE	219 ZWART ROAD	DES MOINES, IA.	50310	*
DES MOINES ROWING CLUB	ATTN: RICHARD DILLEY	BOX 4051	DES MOINES, IA.	50333	*
DICKSON INDUSTRIES	ATTN: ARTHUR DICKSON	325 SW. 5TH ST.	DES MOINES, IA.	50309	*
DOWNTOWN DES MOINES, INC.	ATTN: SUZANNE DAVIDSON	2103 34TH	DES MOINES, IA.	50310	*
HIGHLAND PARK BUS. CLUB	ATTN: DR. RAY	700 W. EUCLID AVE.	DES MOINES, IA.	50313	*
HIGHLAND PARK BUS. CLUB	ATTN: JAMES DARNER	4129 4TH ST.	DES MOINES, IA.	50313	*
HIGHLAND PARK BUS. CLUB	ATTN: PAUL KORDICK	6702 MCVAY DR.	DES MOINES, IA.	50313	*
IDEAL PHARMACY	ATTN: GARY COTTINGTON	639 FRANKLIN ST.	PELLA, IA.	50219	*
IZAAK WALTON LEAGUE	ATTN: BRUCE HAGEMEYER	ROUTE 1, BOX 62	PELLA, IA.	50219	*
IZAAK WALTON LEAGUE	ATTN: LOYLE MORRIS	P.O. BOX 107	BAXTER, IA.	50028	*
IZAAK WALTON LEAGUE	ATTN: ROY W. OVERTON	FELLOW MERCY MEDICAL CLINIC	WEST DES MOINES, IA.	50265	*
LAVALLE LTD.	ATTN: MICHAEL LAVALLE	KALEIDOSCOPE MALL-SUITE 105	DES MOINES, IA.	50309	*
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NATL. AUDUBON SOCIETY	NORTH MW. REPRESENTATIVE	730 HENNEPIN AVE.	MINNEAPOLIS, MN.	55403	*
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SIERRA CLUB	ATTN: BILL SCHAUDT	3908 WAVELAND DR.	DES MOINES, IA.	50311	*
SIERRA CLUB	ATTN: DEBORAH NEUSTADT	1261 E. 23RD	DES MOINES, IA.	50317	*
SIERRA CLUB	ATTN: DENNIS NICHOLOSON	3500 KINGMAN BLVD.	DES MOINES, IA.	50316	*
SIERRA CLUB	ATTN: JANE ELDER	214 N. HENRY ST.-SUITE 203	MADISON, WI.	53703	*
SIERRA CLUB	IOWA CHAPTER	1006 N. D ST.	INDIANOLA, IA.	50125	*
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TRI-COUNTY VETS		ROUTE 2	PELLA, IA.	50219	*
VALLEY NATIONAL BANK	ATTN: STEPHEN WATERS	731 SANDAHL	DES MOINES, IA.	50316	*
VEENSTRA & KIM, INC.,	ATTN: JUANITA KINCADE	1601 22ND ST.	WEST DES MOINES, IA.	50265	*
WEBBS COUNTRY CAMPING	ATTN: DALE WEBB	RURAL ROUTE 1	HARTFORD, IA.	50118	*
WOODWARD, DAVIS & ROSSI	ATTN: JAMES C. DAVIS	700 WALNUT ST.	DES MOINES, IA.	50309	*
ACKERMAN	DENNIS G.	416 BOONE ST.	BOONE, IA.	50036	*
ADAMS	CHARLES	ROUTE 2	GILMORE CITY, IA.	50541	*
ADAMS	DOYLE D.	707 N. 7TH	INDIANOLA, IA.	50125	*
ADAMS	JANET	1102 DIVISION	WEBSTER CITY, IA.	50595	*
ADAMS	LARRY	812 1/2 STORY ST., BOX 1	BOONE, IA.	50036	*
ADAMS	MR. & MRS. BILL	RURAL ROUTE 3	KNOXVILLE, IA.	50138	*
ALLIE	MR. & MRS. LESTER	1328 LINN ST.	BOONE, IA.	50036	*
ALTHOLL	DAVE	3005 45TH	DES MOINES, IA.	50310	*
ANDERS	ROBERT	1424 CUMMINS PARKWAY	DES MOINES, IA.	50311	*
ANDERSON	DAVID P.	ROUTE 1, BOX 132	STRATFORD, IA.	50249	*
ANDERSON	LAWRENCE	128 APPLE AVE., BOX 313	WEBSTER CITY, IA.	50595	*
ARMINGTON	DONALD R.	3125 JOHN PATTERSON ROAD	DES MOINES, IA.	50317	*
ARMSTRONG	MARY L.	509 N. 9TH ST.	GRIMES, IA.	50111	*
ATKIN	DAVID	3008 SW. 12TH	DES MOINES, IA.	50315	*
BAKER	JULIE	621 E. 16TH ST. N.	NEWTON, IA.	50208	*
BAKER	MR. & MRS. DON	3212 92ND	URBANDALE, IA.	50322	*
BARTELMA	DAN & JIM	RURAL ROUTE 1	RUNNELLS, IA.	50237	*
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BEATTIE	MR. & MRS. VERN	RURAL ROUTE 2	RUNNELLS, IA.	50237	*
BECKER	DAVID	808 N. 2ND	PELLA, IA.	50219	*
BEDNAR	TOM	1331 S. 27TH ST.	FORT DODGE, IA.	50501	*
BEELER	LARRY	BOX 41	PERU, IA.	50222	*
BELL	CHARLES	349 DUBUQUE	NORWALK, IA	50211	*
BELL	PERRY	P.O. BOX 458	KNOXVILLE, IA.	50138	*
BELT	DEB	1901 A AVE. W., BOX 530	OSKALOOSA, IA.	52577	*
BENNETT	LARRY	RURAL ROUTE 2	RUNNELLS, IA.	50237	*
BENSON-LARSON	KATE	3107 78TH ST.	DES MOINES, IA.	50322	*
BESTELL	BILLY	ROUTE 1, BOX 106	NEWTON, IA.	50208	*
BILLINGSLEY	MIKE	RURAL ROUTE 3	KNOXVILLE, IA.	50138	*
BILLINGSLEY	MR. & MRS. DON	ROUTE 1, BOX 148	LOCKRIDGE, IA.	52635	*
BIRD	BILL	ROUTE 1	LEHIGH, IA.	50557	*
BIRKENHOLZ	IRVIN	110 W. DOUGLAS	KNOXVILLE, IA.	50138	*
BISBEE	RAY	512 LIBERTY	PELLA, IA.	50219	*
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BODIE	BLANCHE E.	ROUTE 4, BOX 337	KNOXVILLE, IA.	50138	*
BOEKELMAN	V.H.	1239 25TH AVE. N.	FORT DODGE, IA.	50501	*
BOEYINK	GARY	RURAL ROUTE 3	PELLA, IA.	50219	*
BOSTON	MR. & MRS. RICK	2105 VISTA CIRCLE NW.	CEDAR RAPIDS, IA.	52405	*
BOVENKAMP	LARRY	316 E. 24TH ST. N.	NEWTON, IA.	50208	*
BOWERS	MR. AND MRS. B.D.	401 W. PARK	RUNNELLS, IA.	50237	*
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RED ROCK, IOWA

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DAVIDSON	SUZANNE	2103 34TH	DES MOINES, IA.	50310	*
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DE BOEF	HARRIET	ROUTE 1	NEW SHARON, IA.	50209	*
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RED ROCK, IOWA

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DUNCAN	STEVE	ROUTE 4	BOONE, IA.	50036	*
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ERB	MR. & MRS. THEODORE	ROUTE 1, BOX 116	ARGYLE, IA.	52619	*
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RED ROCK, IOWA

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RED ROCK, IOWA

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MESSICK	DENNIS	1400 N. 9TH AVE. PL. E.	NEWTON, IA.	50208	*
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RED ROCK, IOWA

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MOORE	POLLY	4139 GREENWOOD DR.	DES MOINES, IA.	50312	*
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MOTT	JOYCE	104 W. PARK	RUNNELLS, IA.	50237	*
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MYERS	ROBERT	917 S. 2ND AVE. W.	NEWTON, IA.	50208	*
NAVEN	DEAN H.	1503 4TH AVE. N.	FORT DODGE, IA.	50501	*
NEARY	DON	3834 MERCED ST.	DES MOINES, IA.	50310	*
NEIL	RON	215 E. 8TH	PELLA, IA.	50219	*
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PENDRY	DALE	2288 DAKOTA ST.	HARTFORD, IA.	50118	*
PENNELL	BRENDA	632 12TH AVE. N.	FORT DODGE, IA.	50501	*
PERSON	DEAN	6392 SE. 104TH ST.	RUNNELLS, IA.	50237	*
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PHELPS	CHRIS	110 1/2 W. MAIN ST.	WASHINGTON, IA.	52353	*
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PILLE	CHARLES	902 E. 16TH ST. N.	NEWTON, IA.	50208	*
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RED ROCK, IOWA

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RYE	JOHN	909 S. 7TH AVE. W.	NEWTON, IA.	50208	*
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SANDERS	JIM	1519 GLENWOOD	DES MOINES, IA.	50320	*
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RED ROCK, IOWA

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STEPHENS	ROLAND	RURAL ROUTE 4	BOONE, IA.	50036	*
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VANDERLINDEN	LEE	3009 44TH	DES MOINES, IA.	50310	*
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VISSER	MR. & MRS. GLEN	RURAL ROUTE 1,	HARVEY, IA.	50119	*
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VOS	MURRAY	ROUTE 2, BOX 228	PELLA, IA.	50219	*
VOS	VICKI	1940 NW. 82ND ST. APT. 19	DES MOINES, IA.	50322	*
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